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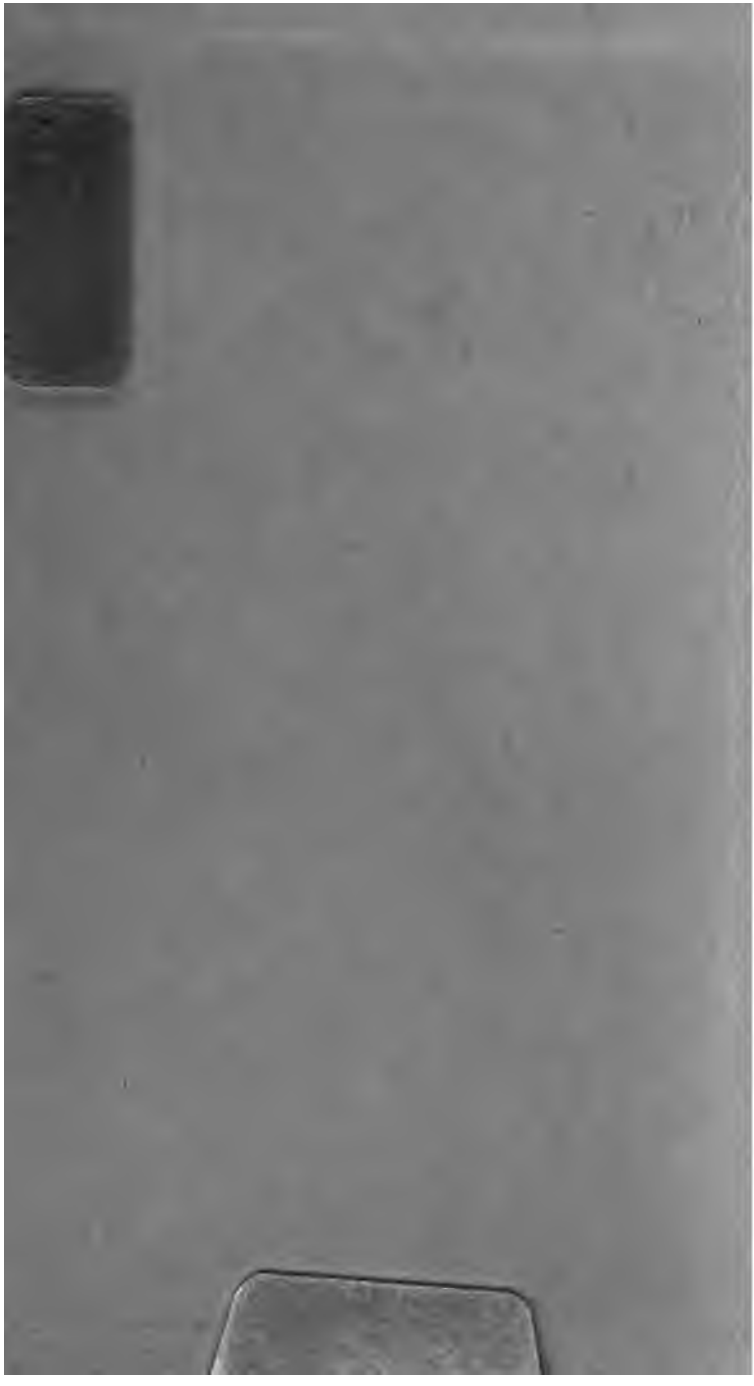


Foye

TABLES

FOR THE

DETERMINATION,

DESCRIPTION AND CLASSIFICATION

OF

MINERALS.

BY

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PREFACE.

The object of the author of this little work is to furnish tables, by means of which, with as few easy tests as possible, students may be enabled to determine and classify minerals found in the United States and become familiar with their principal characteristics. Everything has been made to subserve these ends, which will account for want of uniformity in any respect between the different parts of the tables. Minerals having varying characteristics or characteristics which are liable to be mistaken by the student, are repeated under two or more heads as may be necessary.

The nomenclature and classification of Dana as given in the fifth edition of his Mineralogy have been closely followed.

In this revised edition a table describing the species, a table classifying species by basic elements and ores and the blow-pipe reactions referred to in the work, have been added.

Appleton, Wis., March, 1882.

CONTENTS.

INTRODUCTION.

APPARATUS AND REAGENTS.

The following list includes all the apparatus and reagents needed in determining minerals by these Tables.

A three cornered file for cutting glass tubes and testing hardness.

A small magnet.

A strong knife may be used for testing hardness and if it has a magnetized blade may be used for a magnet.

Steel forceps, a small hammer and anvil and a small agate mortar and pestle for crushing and pulverizing specimens.

Cutting pliers for obtaining small pieces of a mineral for blow-pipe or chemical assay.

Platinum pointed forceps for use in testing fusibility and color of flame.

A magnifying glass is often convenient for examining assays after ignition.

Well burnt charcoal, platinum foil and wire for supports.

Test tubes and glass tubes for supports and testing the presence of water.

A lamp (for blow-pipe purposes) with a large wick, fed with olive oil, or a mixture of twelve parts alcohol and one part turpentine.

An alcohol lamp for heating substances in test tubes.

When gas can be had it is better to use a Bunsen's burner in place of a lamp.

Blow-pipe with platinum jet.*

Sodic Carbonate usually called Soda, Borax, Salt of Phosphorus sometimes called Microcosmic Salt, Cobalt Nitrate in solution, Potassic Bisulphate, Barium Chloride, Fluorite (Fluor Spar), Tin Foil.

Hydrochloric, Nitric and and Sulphuric Acids, Hydrochloric Acid diluted one-half with water for testing solubility with effervescence.

Litmus Paper both red and blue and Brazil-wood Paper.

SCALE OF HARDNESS.

1.—Talc; laminated light-green variety. Easily scratched by the nail.

2.—Gypsum; a crystalline variety. Yields with difficulty to the nail. Does not scratch copper coin.

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* The author has found that a very cheap and good substitute for the more expensive blow-pipe generally used, can be made in a few moments from the common clay pipe. Having broken off a piece of the pipe stem of suitable length for a jet, fill about one-fourth of an inch of the end with soft putty through which pass a fine needle, The putty is then to be hardened in the flame of a spirit lamp and the needle removed. Fit the jet thus made into a cork and the cork into the bowl of another pipe. The extremity of the jet may be shaped if necessary with a common file.

3.—Calcite; transparent variety. Scratches and is scratched by copper coin.

4.—Fluorite (Fluor Spar); crystalline variety. Not scratched by copper coin; does not scratch glass.

5.—Apatite; transparent variety. Scratches glass with difficulty, leaving its powder on it. Yields readily to the knife.

6.—Orthoclase; white cleavable variety. Scratches glass readily. Yields with difficulty to the knife.

7.—Quartz; transparent variety. Does not yield to the knife. Yields to the edge of the file though with difficulty.

8.—Topaz; transparent variety.

9.—Sapphire; cleavable varieties.

10.—Diamond.

SCALE OF FUSIBILITY.

1.—Stibnite (Gray Antimony). Fusible in coarse splinters in the summit of a candle flame without the blow-pipe.

2.—Natrolite. Fusible in fine splinters in the summit of a candle flame without the blow-pipe.

3.—Almandite (Iron-Alumina-garnet). Does not fuse in the candle flame. Fuses easily before the blow-pipe in obtuse pieces.

4.—Green Actinolite. Fusible before the blow-pipe in coarse splinters.

5.—Orthoclase. Fusible before the blow-pipe in fine splinters.

6.—Bronzite. Before the blow-pipe becomes rounded only on the sharp edges.

SYSTEMS OF CRYSTALLIZATION.

1.—Isometric: Three axes rectangular and equal.

2.—Tetragonal: Three axes rectangular, two lateral axes equal.

3.—Orthorhombic: Three axes rectangular and unequal.

4.—Monoclinic: Three axes unequal, two rectangular.

5.—Triclinic: Three axes unequal, and obliquely inclined.

6.—Hexagonal: Four axes, the three lateral intersecting at an angle of 60°, the vertical axis at right angles to the other three.

BLOW-PIPE REACTIONS.

The examination of assay with borax and salt of phosphorus is generally made on platinum wire where the color of the bead is more readily observed. Make a small loop in the end of the platinum wire, heat it to whiteness in the blow-pipe flame and dip it into powdered borax or salt of phosphorus; heat again in the blow-pipe flame (adding more of the reagent if necessary) until a clear glassy bead is formed. While the bead is hot and soft touch it to a minute speck of the assay and heat again in the oxidizing, then in the reducing flame. If no distinct color is produced add a little more of the assay to the same bead and heat again, repeating the operation as many times as may be necessary.

The examination with soda is generally performed

on charcoal in the reducing flame. When the result looked for is the production of minute globules of metal, care should be taken that they do not escape observation. If necessary a portion of the charcoal around the assay may be cut out, ground up with a little water in a small mortar and the charcoal and soda washed away. Any shining particles of metal may then be readily detected. When two or more metals are present an alloy is usually formed.

Aluminum.—Heat in the oxidizing flame a small fragment of the mineral on charcoal or in platinum pointed pincers, moisten with a drop of the cobalt solution and heat again. If the mineral assumes a blue color it indicates the presence of aluminum.

This test is not applicable to fusible minerals, as fusible silicates give the same result, nor to minerals not white or nearly so after ignition. If the assay is not sufficiently porous to absorb the solution it should be powdered.

Antimony.—On charcoal the assay yields dense, white, inodorous fumes which partly escape and partly condense on the coal. In the open tube, similar results are obtained. In a closed tube when sulphur is present the mineral yields a sublimate, black while hot but becoming brownish red when cold.

Arsenic.—On charcoal most compounds of arsenic yields a white coating and evolve a garlic odor. Arsenic and some of its compounds when heated in a closed tube give a sublimate which has a metallic lustre: if the mineral contains sulphur as well as arsenic a red or yellow sublimate of a sulphide of arsenic may be formed. In an open tube a white sublimate

of arsenious oxide is produced and the characteristic garlic odor given off. Some compounds of arsenic impart a light blue color to the outer blow-pipe flame.

Barium.—A yellowish green color is imparted to the outer blow-pipe flame by many of the compounds of barium.

Bismuth.—Before the blow-pipe on charcoal, bismuth yields a coating which is dark orange yellow while hot and lemon yellow when cold, the yellow coating being unusally surrounded by a white ring.

Boron.—Boron imparts a bright yellowish green color to the blow-pipe flame; this is heightened by moistening the assay with sulphuric acid before heating. If the result is not satisfactory, mix one part of the powdered mineral with one part fluorite and three of potassic bisulphate and fuse on platinum wire: boron if present will impart the green color to the flame at the instant of fusing.

Cadmium.—Before thc blow-pipe on charcoal cadmium gives a coating which is, when cold, reddish brown. The test is more delicate when soda is used.

Chromium.—With borax, both in the oxidizing and reducing flame, chromium gives a bead which is green when cold. Tin causes no change.

Cobalt.—With borax on platinum wire, minerals containing cobalt give a blue bead. If arsenic or sulphur is present the assay should first be heated on charcoal till fumes are no longer emitted. If a small quantity of iron is present the bead will be green while hot, but blue when cold. When the amount of iron is greater, the bead will be dark green while hot and bright green when cold.

Copper.—When copper characterizes a mineral it can be reduced to the metallic state by heating the assay with soda on charcoal. With borax or salt of phosphorus a red bead is formed in the reducing flame; in the oxidixing flame the bead is green while hot but becomes greenish blue or blue on cooling. When the bead is formed on charcoal with borax or salt of phosphorus in contact with tin, it assumes a very characteristic red color. Most copper compounds color the flame green.

Fluorine.—Fluorine combined with weak bases and little water may be tested by heating the substance in a closed tube in which a strip of moistened Brazil-wood paper is inserted. The paper becomes straw yellow and a ring of silica is deposited near the assay. Another process by which the presence of fluorine in any combination may be shown, is to mix the pulverized assay with some salt of phosphorus previously fused on charcoal and powered and heat the mixture in an open glass tube in such a way that the flame may be carried inside the tube by the current of air. Fluorine is recognized by its pungent odor, its effect on glass, and by moistened Brazil-wood paper placed in the upper end of the tube becoming straw yellow.

Iodine.—Fused on charcoal, iodides gives fumes of of iodine. Fused with potassic bisulphate in a test tube, compounds of iodine yield violet vapors which condense in upper part of the tube.

Iron.—With borax on platinum wire a very little iron with the oxidizing flame gives a glass which is yellow when hot, colorless on cooling; with more, the

glass is red while hot, yellow when cold; with still more it is dark red when hot and yellow when cold. In the reducing flame the glass becomes bottle green. Minerals containing much iron become magnetic when highly heated in the reducing flame, especially if soda is used.

Lead.—Fused with soda in the reducing flame on charcoal, compounds of lead yield a globule of the metal. When heated on charcoal a coating is produced which is lemon yellow while hot and sulphur yellow when cold. The coating imparts to the reducing flame an azure blue color.

Lithium.—Some compounds of lithium color the blow-pipe flame bright purple-red when heated in the platinum forceps. To obtain the best result, mix one part of the powdered mineral with one part each of fluorine and potassic bisulphate, make the whole into a paste with a little water and fuse on platinum wire when even if but little lithium is present, the characteristic color will be imparted to the flame.

Magnesium.—Proceed as when testing for alumium. A magnesium mineral will assume a pale red or pink color. The test is applicable to both fusible and infusible minerals which are white or nearly so after the first ignition.

Manganese.—Manganese is very readily detected by fusing a little of the powdered substance with two or three times its volume of soda on platinum foil. A green mass flows around the undissolved portion and on cooling becomes bluish green. With borax on platinum wire manganese yields in the oxidizing flame a glass which is violet when hot but on cooling be-

comes violet red. An excess renders the glass quite black and opaque.

Mercury.—Compounds of mercury when heated in a closed tube with soda yield a sublimate of metallic mercury, which may be rubbed into globules with a piece of copper wire.

Molybdenum.—Molybdenum colors the blow-pipe flame yellowish green. Its compounds before the blow-pipe on charcoal yield a coating which is yellow while hot and white when cold. The white coating assumes an azure blue color when touched with an intermittent reducing flame.

Nickel.—When volatile substances are present, the assay must be strongly heated on charcoal in the reducing flame until it no longer emits fumes or odors. With borax on platinum wire, nickel yields a bead in the oxidizing flame which is violet while hot but reddish brown when cold. In the reducing flame the bead becomes gray and cloudy, sometimes opaque, from a separation of metallic nickel. With continued blowing the metal collects together and the bead becomes colorless. The reaction is obscured by the presence of iron, cobalt or copper.

Phosphorus.—Phosphates impart a dirty green or bluish green color to the blow-pipe flame. The color is more distinct if the powdered mineral is first moistened with sulphuric acid and then fused on platinum wire.

Potassium.—Potassium imparts a pale violet color to the blow-pipe flame. The color is obscured if sodium or lithium is present.

Silicon.—Silicates when fused with soda on charcoal

dissolve with effervescence, forming a glass which is transparent while hot. With salt of phosphorus on platinum wire silicates are decomposed, the "skeleton of silica" floating in the clear hot bead.

Silver.—Many compounds of silver yield a globule of the metal when fused with soda on charcoal in the reducing flame. When treated for a long time with the reducing flame a slight, dark red coating is produced.

Sodium.—Compounds of sodium impart an intense yellow color to the blow-pipe flame.

Strontium.—When a mineral contains strontium it colors the blow-pipe flame bright red. When moistened with hydrochloric acid the color imparted to the flame is more intense.

Sulphur.—Sulphides yield fumes of sulphur when heated on charcoal, in a closed tube or in an open tube. A compound of sulphur when heated on charcoal with soda yields a mass which stains a silver coin black or brownish black when moistened and placed upon it.

Tellurium.—On charcoal tellurium gives a white coating and colors the reducing flame green. In an open tube a white or whitish sublimate is produced which, before the blow-pipe, fuses to clear, colorless drops.

Tin.—Fused with soda on charcoal in the reducing flame compounds of tin yield a globule of the metal, at the same time a coating is formed on the coal which is slightly yellow when hot but is white when cold. This coating moistened with the cobalt solution

and heated in the oxidizing flame assumes a bluish green color.

Titanium.—On platinum wire with salt of phosphorus in the oxidizing flame, titanium forms a clear bead which appears yellow while hot if much is present but becomes colorless on cooling. The same bead reddens and finally assumes a violet color in the reducing flame. With salt of phosphorus on charcoal the bead becomes violet in the reducing flame if treated with tin. If iron is present the reaction will be obscured.

Tungsten.—With salt of phosphorus on platinum wire in the oxidizing flame a yellowish or colorless bead is produced which, treated with the reducing flame, is green while hot but blue when cold. On charcoal with salt of phosphorus in the reducing flame the bead becomes a deep green if treated with tin. The reaction is obscured if iron is present.

Water.—When the powdered mineral is heated in a closed tube, water, if present, will be condensed on the colder portion of the tube and may be tested with litmus paper to ascertain if it is acid or alkaline.

Zinc.—Some compounds of zinc when heated on charcoal, either alone or with soda, yield a coating which is yellow while hot but white when cold. The coating wet with the cobalt solution and then heated assumes a fine yellowish green color which is most distinct when cold.

HOW TO USE THE TABLES.

When determining a mineral, begin with first divi-

sion of Table I. and subject the specimen to the tests designated under I., II., III., etc., in their order. Having found the specimen to give the result called for under some one division, apply the tests in the order in which they occur in that division. Direction by number will thus be found to a division of Table II. where other tests will be given by which the species to which the mineral belongs may be found.

The numbers against the names of the species in Table II. refer to Table III. which briefly describes, and to Table IV. which classifies, minerals found in the United States.

ABBREVIATIONS.

B. B., before the blow-pipe.
H., hardness, see page 8.
Fus., fusibility, see page 9.
No., number.
S. C., System of Crystallization, see page 10.
Sp. Gr., specific gravity.
Yields water, i. e. when heated in a test tube or matrass deposits moisture on the cool surface.

DETERMINATION OF MINERALS.

TABLE I.

PRELIMINARY EXAMINATION.

(For abbreviations see page 18. The figures refer to divisions in Table II.)

- I. Soluble (having taste).
  - Effervesces in either hot hydrochloric or sulphuric acid... 1
  - No effervescence in either acid.
    - Yields water.
      - Yields no water..... 2
      - B. B. becomes magnetic..... 3
      - B. B. does not become magnetic.
        - With barium chloride yields white precipitate, 4
        - With barium chloride yields no precipitate, 5
- II. Soluble with effervescence in hydrochloric acid, yielding no odor*.
  - Yields water.
    - Fusible, 6
    - Infusibe, 7
  - Yields no water.
    - Fusible, 8
    - Infusible, 9
- III. Soluble in hydrochloric acid, yielding chlorine (a yellowish green gas of suffocating odor).
  - Yields water, 10
  - Yields no water, 11

*Do not mistake the odor of the acid for a gas yielding an odor.

IV. B. B. on coal yields odorous or colored fumes or coats the coal*.

- B. B. becomes magnetic.
  - Fumes of sulphur, 12
  - Fumes of arsenic, 13
  - Fumes of antimony and sulphur, 14
- B. B. with soda on coal yields globules of
  - Copper.
    - Fumes of arsenic, 15
    - Fumes of sulphur, 16
    - Fumes of antimony, more or less impure, 17
  - Silver 18
  - Lead.
    - Fumes of sulphur, 19
    - Fumes of arsenic, 20
    - Coating but no odor, 21
- Not included above.
  - Infusible.
    - Fumes of sulphur, 22
    - Fumes of antimony, 23
    - Fumes of arsenic, 24
    - Coating but no odor, 31
  - Fusible.
    - Fumes of sulphur only, 25
    - Fumes of arsenic only, 26
    - Fumes of antimony only, 27
    - Fumes of sulphur and arsenic, 28
    - Fumes of sulphur and antimony, 29
    - Acrid fumes, 30
    - Coating but no odor, 31

V. Magnetic either before or after ignition (gives no odorous or colored fumes).
- Fusible.
  - Yields water, 32
  - Yields no water, 33
- Infusible.
  - Yields water, 34
  - Yields no water, 35

VI. B. B. with soda on coal yields tin or copper (no fumes). 36

*A white coating from the combustion of charcoal always appears and must not be mistaken for a coating from the specimen.

VII. Not included in the preceding divisions.

- Fusible.
  - Yields water.
    - Micaceous structure, 37
    - After ignition reacts alkaline, 38
    - B. B. intumesces, 39
    - B. B. exfoliates, 40
    - Not included above, 41
  - Yields no water.
    - Micaceous structure, 42
    - Fuses to a metallic globule, 43
    - After fusing reacts alkaline, 44
    - Not included above.
      - B. B. intumesces or swell up, 45
      - B. B. fuses quietly, 46
- Infu'ble.
  - Ignited and moist'ned with cobalt solution and again ignited assumes blue color.
    - Yields water, 47
    - Yields no water, 48
  - Treated with cobalt solution does not assume blue color.
    - Yields water 49
    - Yields no water.
      - H.=3 or less, 50
      - H.=4—6.5, 51
      - H.=7 or more, 52

TABLE II.

FINAL EXAMINATION.

(The figures on the right refer to Tables III. and IV.)

1. Effervesces in hydrochloric acid,.....Gay-Lussite, 255
   Effervesces in sulphuric acid.
   - Yielding a suffocating odor,....Halite, 55
   - Yielding no odor.
     - Taste saline, cooling, Nitre, 214
     - Taste sharp, bitter, Nitrocalcite, 215

2. B. B. fumes of arsenic.....Arsenolite, 93
   B. B. no fumes of arsenic.
   - Streak white....Glauberite, 230
   - Streak metallic.....Copper, 7

3. Streak yellow, shining.....Jarosite, 240
   Streak white, faintly greenish.....Morenosite, 235
   Streak uncolored.....Melanterite, 234

4. B. B. with soda on coal yields copper,.....Chalcanthite, 236
   B. B. becomes brown or black.....Johnannite, 241
   B. B. white mass.
   - Which does not react alkaline.....Alunogen, 237
   - Which reacts alkaline.
     - Fused assay moistened with cobalt solution becomes blue, B. B.
       - With borax gives manganese reaction, Bosjemanite, 239
       - With borax no manganese reaction, Kalinite, 238
     - Fused assay with cobalt does not become blue.
       - Is in fine grains, Epsomite, 233
       - Is in coarse grains, or crystals, Mirabilite, 231

5. H=1.....Sassolite, 217
   H=2—2½.....Borax, 218

6. Colors blow-pipe flame green,
   - Color blue...Azurite, 263
   - Color greenMalachite, 262

   Fuses to a white enamel, col'rs flame yellow,Gay Lussite, 255
   Fused on coal, gives a yellow coating.....Bismutite, 264
   Not included above.....Remingtonite, 259

7. After ignition reacts alkaline.
   - Yields but traces of water, Magnesite, 245
   - Yields much water, Hydromagnesite, 256

   After ignition does not react alkaline.
   - B. B. with soda on coal gives zinc vapors
     - Streak pale green or bluish, Aurichalcite, 261
     - Streak shining, Hydrozincite, 260
   - B. B. with soda on coal gives no zinc vapors,.....Lanthanite, 258

8. B. B. with soda on coal, yields lead.
   - Dissolves in nitric acid leaving white residue, Leadhillite, 228
   - Dissolves in nitric acid, without residue,.....Cerussite, 251

   B. B. with soda on coal yields no lead.
   - Dilute solution in hydrochloric acid yields to sulphuric acid a white precipitate,.....Witherite, 249
   - Dilute solution in hydrochloric acid yields to sulphuric acid no precipitate.
     - Fuses with intumescence and blackens, Rhodonite, 104
     - F'ses quietly and does not blacken, Wollastonite, 102

9. Not included above.
   - B. B. blackens and becomes magnetic,.....Siderite, 246
   - B. B. with soda on coal gives zinc vapors,.Smithsonite, 247
   - Dissolves readily in cold dilute hydrochloric acid.
     - Dilute solution yields precipitate with sulphuric acid,.....Strontianite, 250
     - Concentrated but not dilute solution yields precipitate with sulphuric acid.
       - B. B. falls to pieces, Aragonite, 248
       - B. B. does not fall to pieces.....Calcite, 243
   - Does not or slightly effervesce in cold dilute hydrochloric acid, but readily if heated.
     - Concentrated solution gives precipitate with sulphuric acid,.....Dolomite, 244
     - No precipitate with sulphuric acid,.....Magnesite, 245

10.
   - Soils fingers chocolate brown,.....Wad, 92
   - H=4. Streak reddish brown, nearly black,..Manganite, 86
   - H=5—6. Streak brownish black shining,...Psilomelane, 91

11.
   - H=2½—3½. Stains paper black.....Pyrolusite, 82
   - H=5—5½. Color brownish black. Streak chestnut brown,.....Hausmannite, 78
   - H=5—6. Color iron black to dark steel gray. Streak brownish black, shining.....Psilomelane, 91
   - H=6—6½. Streak and color dark brownish black,.....Braunite, 79

12. Infusible,.....Sphalerite. 27
12. Fusible. Magnetic or powder attracted by magnet before fusing,.....Pyrrhotite. 33
12. Fusible. Not Magnetic before fusing. H=3—4. Color red or brown, Bornite, 26
12. Fusible. Not Magnetic before fusing. H=3—4. Color brass yellow. Streak greenish black. Chalcopyrite, 38
12. Fusible. Not Magnetic before fusing. H=3—4. Color brass yellow. Streak bright,.....Millerite, 32
12. Fusible. Not Magnetic before fusing. H=5.5. Color steel gray tarnishing copper red,.....Linnaeite, 40
12. Fusible. Not Magnetic before fusing. H=6—6.5. Color brass yellow. Pyrite, 37
12. Fusible. Not Magnetic before fusing. H=6—6.5. Color bronze yellow (sometimes including to greenish),.....Marcasite. 43

13. Yields water,.....Scorodite, 208
13. Yields no water. Decomposed in nitric acid giving pink solution,.....Smaltite, 41
13. With nitric acid solution not pink. Heated in a closed tube gives red sublimate then black, Arsenopyrite, 45
13. With nitric acid solution not pink. Heated in a closed tube gives black sublimate at first,..Leucopyrite, 44

14. Yields mixed fumes of sulphur and antimony, Berthierite. 46

15. Yields water,.....Pseudomalachite, 207
15. Yields water. Slightly malleable. H=3.5, ...Whitneyite, 23
15. Yields water. Brittle. Fracture uneaven. H=3—3.5 Domeykite, 21
15. Yields water. Brittle. Fracture subconchoidal with granular surface. H=4.....Algodonite, 22

16. Fuses quietly. H=2—2.5,.....Aikinite, 49
16. Fuses quietly. H=3.5—4,.....Chalcopyrite, 38
16. Fuses and boils with spirting,.....Chalcocite, 29

17. Fumes thick, more or less mixed with sulphur and arsenic,.....Tetrahedrite, 50
Faint coating of antimony, arsenic and oxide of zinc, Enargite, 54

18. Fumes of sulphur only,.....Argentite, 24
Fumes of sulphur and antimony. Streak red,.....Pyrargyrite, 47
Streak black,.....Stephanite, 52
Fumes of sulphur and arsenic,.....Proustite, 48
White coating on coal with red or yellow border, Hessite, 28
Purple red fumes (iodine),.....Iodyrite, 57
Acrid fumes,.....Cerargyrite, 56

19. B. B. gives fumes of sulphur and antimony, nearly volatilizes,.....Geocronite, 51
B, B. gives sulphur fumes only, not volatilized, Galenite, 25

20. Lead globule produced on coal without soda, Mimetite, 200
Lead globule only by use of soda, ...Pyromorphite, 199

21. Fuses on coal to an angular globule,....Pyromorphite, 199
Fuses to a globule not angular.
Streak white. Fuses to a metallic globule or mass, Wulfenite, 223
Fuses to a non-metallic globule or mass, Anglesite, 227
Streak not white. C'lor red (somet'mes mixed with yellow), Minium, 80
Color yellow, reddish, Massicot, 64

22. H=1,.....Molybdenite, 20
H=3—4. With soda on coal, a zinc green flame, Sphalerite, 27
With soda on coal, a reddish brown coating,.....Greenockite, 34

23. H=3—4. Color yellowish green to black,.....Partzite, 97
H=4—5. Color yellow, white or reddish,...Cervantite, 96

24. Volatilizes, giving fumes of arsenic,.....Arsenic, 10

25. Burns with a bluish flame,.....Sulphur, 13
Does not burn. — Color red or brownish red,.....Cinnabar, 31
Color not red. — Fuses quietly,...Stromeyerite, 30
Fuses with spirting, Bismuthinite, 18

26. Yields water. — Soft. Color green. Streak greenish white, Annabergite, 206
H=1.5—2.5. Colors violet, rose, gray, Streak lighter than color,.....Erythrite, 205
H=3.5—4.5. Colors pale green, brown, Streak white,.....Scorodite, 208
Yields no water. — Volatilizes before the blow-pipe,..Arsenic, 10
Does not volatilize. — Color tin white, steel gray, tarnishes,...Smaltite, 41
Color pale copper red, tarnishes,.....Niccolite, 35

27. Fumes of antimony only,.....Antimony, 11

28. H=1.5—2.....Orpiment, 16
H=5.5.....Gersdorffite, 42

29. Volatilizes before the blow-pipe,.....Stibnite, 17
Fuses with spiriting,.....Polybasite. 53

30. Acrid fumes (fluorine),.....Cryolite, 60

31. Yellow or white coating, or both. — When gently heated gives coating of mercury, Gold Amalgam, 6
Fusible. — Infusible.....Zincite, 63
B. B. volatilizes — Color steel gray. Soils paper,.....Tetradymite, 19
Color and streak, silver white,.....Bismuth, 12
Not volatile. — Yields water,..Montanite, 242
Yields no water. — H=1—2. Molybdite, 94
H=5, Willemite, 113

32. Fuses with intumescence or swells up.
- B. B. white or grayish white glass, Lepidolite, 126
- B. B. dark blebby glass, ... Allanite, 117
- B. B. grayish black globule, bluish green flame, ... Vivianite, 204
- B. B. black or dark brown mass or globule.
  - H=4.5—5, Childrenite, 211
  - H=6—7, Epidote, 118

32. Fuses quietly.
- H=2. Soft and adhesive when moist, Glauconite, 170
- H=2.5
  - Luster somewhat pearly, Corundophilite, 190
  - Luster dull or glistening, Thuringite, 193
- H=2.5—3.5. Luster feeble, sub-resinous, Hydrophite. 174
- H=3—4. Luster between vitreous and pearly or brassy, ... Stilpnomelane, 169
- H=5. Luster sub-resinous, ... Triphylite, 202

33. Streak white or lighter than color.
- Streak black, grayish black, or dark reddish brown
  - H=5—5.5, ... Wolframite, 221
  - H=7—7.5, .. Schorlomite, 146

33. Streak white or lighter than color. — Fuses to a glass or mass black or darker than specimen.
- B. B. with soda, a light coating of oxide of zinc.
  - Color red or gray, Danalite, 114
  - Color black, Jeffersonite,*
- Fuses to a glass lighter than specimen, Tourmaline, 138

33. Streak white or lighter than color. — Fuses to a glass or mass black or darker than specimen. — Fuses with intumescence.
- Luster vitreous or pearly
  - Color green ..... Epidote, 118
  - Color black or greenish black.
    - Amphibole, 108
    - or
    - Pyroxene†, 103
- Luster submetallic or resin's, Allanite, 119

33. Streak white or lighter than color. — Fuses to a glass or mass black or darker than specimen. — Fuses without intumescence.
- When powdered and moistened with sulphuric acid, on platinum wire, colors flame bluish green with red streaks ..... Triphylite, 202
- Luster pearly. Streak gray or brownish gray ..... Hypersthene, 101
- Luster vitreous or resinous. Streak white ..... Garnet, 115

*See appendix 7.
†See appendix I and II.

34. Streak uncolored or grayish.....Chloritoid, 191
Streak red.....Turgite, 83
Streak brownish yellow or ochre yellow.....Gothite, 85
Streak yelowish brown.....Limonite, 87

35. Streak metallic or submetallic, powder black or reddish brown,.....Menaccanite, 68
Streak black.....Magnetite, 71
Streak dark reddish brown. B. B. with borax and soda and strongly heated on coal, gives coating of oxide of zinc.....Franklinite, 72
Streak brown (no coating of ozide of zinc on coal), Chromite, 73
Streak cherry red or reddish brown.....Hematite, 67
Streak uncolored or grayish.....Staurolite, 145

36. Yields tin,.....Cassiterite 75
Yields copper. Fusible, Yields w'ter, Pseudomalachite, 207; Yields no water.....Cuprite, 61
Yields copper. Infusible, Yields water....Chrysocolla, 150; Yields no water..Melaconite, 65

37. B. B. exfoliates: Colors flame red.....Cookeite, 185
B. B. glows strongly, gives white or colorless glass,.....Euphyllite, 184
B. B. becomes white, than fuses to a dark gray mass,.....Jefferisite, 186
B. B. intumesces: B. B. blackish mass, colors flame green, Autunite, 213
B. B. fuses to white or grayish glass, Lepidolite, 127
B. B. neither exfoliates or intumesces, Fahlunite,* 182; Margarite, 192

*See Appendix 5.

38. { Fusibility=1 ..... Cryolite, 60
Fusibility=3 ..... Gypsum, 232

39. {
Fuses to a black or colored mass, ... Epidote, 118
Fuses to a black or colored glass, ... Titantite, 144
Fuses to a white or grayish glass, not blebby. { Fus.=2, not scaly, Pinite, 180; Fus.=2, scaly, Lepidolite, 127; Fus.=4 ..... Margarite, 192
Fuses to a white enamel (not blebby). { H=3.5—4, ... Laumonite, 149; H=5—5.5, ... Thomsonite, 157
Fuses to a glass, clear either hot or cold (not blebby), Datolite, 143
Fuses to a glass, clear when hot, opaque when cold (not blebby), ... Amblygonite, 203
Fuses to a blebby glass. { White, opaque, ... Ekebergite, 130; White, nearly opaque, ... Chabazite, 161; Grayish, ... Chlorastrolite, 153; Clear, ... Ulexite, 219
Fuses to a blebby enamel like glass, ... Prehnite, 152
Fuses to a blebby enamel, ... Epistilbite, 163
}

40. {
Fuses on the edges, colors flame red, ... Cookeite, 185
Fuses to a white enamel not blebby, Heulandite 164 and ..... Stilbite,* 162
Fuses to a blebby enamel or glass, ... Apophyllite, 154
}

41. {
Fuses to a colorless glass, Natrolite 158 and Analcite,† 160
Fuses to a green glass, ... Eudialite, 109 a
Fuses to a white enamel, ... Pectolite, 147
Fuses to white blebby glass, ... Fahlunite, 182
}

Fus.=1, ... Cryophyllite, 128
Fus.=4, gives reaction for iron, ... Biotite, 125
Fus.=4, does not give iron reaction, ... Phlogopite, 124

43. B. B. brittle globule,.....Hubnerite, 222
B. B. maleable globule. Not soluble in nitric acid,.....Gold, 1
Soluble in nitric acid. Streak and color siver white, tarnishes,..Silver, 2
Color copper red. Streak metallic, shining, Copper, 7

44. Fused with soda on coal blackens silver if moistened. B. B. with soda sinks into the coal. B. B. white enamel, colors flame yell'wish green, Barite, 224
B. B. white pearl, colors flame red,.....Celestite, 225
B. B. with soda does not sink into the coal,.....Anhydrite, 226
Does not blacken silver as above. H=2.5.....Cryolite, 60
H=4,.....Fluorite, 58

45. B. B. black or colored glass. H=1—2,.....Vermiculite, 185a
H=6.5—7. B. B. gives green color to oxidizing flame.....Axinite, 121
H=5—6.5 B. B. yellow, brown or black glass; with borax yellowish green glass,.....Titanite, 144
B. B. reddish brown or black glass; manganese reaction, Rhodonite, 104
B. B. greenish or brown glass; iron reaction, Vesuvianite, 117
B. B. black mass,.....Epidote, 118
B. B. grayish enamel (not blebby),.....Cryophyllite 128
B. B. blebby enamel,.....Epistilbite, 163
B. B. blebby mass, white or lighter than color. H=7—7.5,.....Tourmaline, 138
H=6—6.5,.....Zoisite, 120
B. B. blebby glass, white or lighter than color. H=5—6,.....Wernerite, 129
H=7—7.5.....Tourmaline, 138
B. B. white or colorless glass, not blebby. H=5—6,.....Sodalite, 132
H=6.5—7,..... Spodumene, 106

46.
- Fuses to white or clear glass or enamel.
  - Gelatinizes in hydrochloric acid.
    - Soluble in hydrochloric acid, ... Apatite, 198
    - Partly soluble in hot hydrochloric acid not gelatinizing, ... Labradorite, 133
  - Not acted upon by hydrochloric acid either hot or cold.
    - B. B. with soda no zinc coating.
      - B. B. with soda, a faint coating of oxide of zinc, Willemite, 113
      - B. B. with soda
        - B. B. with lit'le soda a bead with more a slag, Wollastonite, 102
        - B. B. with soda a bead only, Nephelite, 131
    - When pulverized and moistened with sulphuric acid and fused on platinum wire, gives green flame, ... Danburite, 122
    - When fused with patassic bisulphate and fluorite gives red flame, ... Petalite, 107
    - Neither green or red flame.
      - Oligoclase,* 134
      - Albite, ... 135
      - Orthoclase, 136
- Fuses to a black or colored mass or globule.
  - Fuses to a black slag, ... Tephroite, 112
  - Fuses to a black enamel; with soda gives zinc coating, ... Danalite, 114
  - Fuses to a glass, black or darker than the specimen.
    - Streak white or paler than color.
      - H=3 or less, Asbestus,†
      - H=5–6
        - Amphibole, 108
        - Pyroxene,‡ 103
      - H=6.5—7.5, Garnet, 115
    - Streak grayish black, Schorolomite, 146

42.
- F.
- Fus.
- Fus.=

11.

*See Appendix 6.
†See Appendix 9.

47.
- H=1—2. Not micaceous, blow-pipe flame not red.
  - Plastic when wet. Kaolinite 178
  - or ..... Pholerite,* 177
  - Claylike or earthy but not plastic, Halloysite. 179
  - Neither claylike nor plastic, Pyrophyllite, 166
- H=2—2.5
  - Structure micaceous; blow-pipe flame not red, ... Muscovite, 126
  - Blow-pipe flame red, ... Cookeite, 185
- H=2.5—3.5. Not micaceous, blow-pipe flame not red
  - Argillaceous odor when breathed upon, ... Gibbsite. 89
  - B. B. crumbles and burns white Schrotterite, 156
  - B. B. crumbles and does not burn white, ... Allophane, 155
  - B. B. colors flame green, if pulverized and moistened with sulphuric acid, ... Wavellite, 210
- H=5—6. B. B. colors flame bluish green if pulverized and moistened with sulphuric acid, ... Lazulite. 209
- H=6.5—7. Does not color flame green, ... Diaspore, 84

48.
- B. B. With soda not attacked, ... Corundum, 66
- B. B. with soda yields a slag.
  - In octahedral crystals, ... Spinel, 69
  - Heated in a closed tube decrepitates strongly, giving thin scales, ... Diaspore, 84
  - Gives fluorine reaction, ... Topaz, 142
  - Colored and color does not change B. B., Chrysoberyl, 74
  - Color white or becomes white B. B.
    - Andalusite,† 139
    - Fibrolite' 140
    - Cyanite, ... 141

*See Appendix 8.
†See Appendix 2.

49.
- Heated in close tube blackens.
  - Soft like butter or cheese, but brittle when dry,.....Saponite, 176
  - H=3—4,.....Genthite, 175
  - H=6,.....Turquois 212
- Resembles somewhat gum arabic or resin,..Deweylite, 172
- Micaceous structure.
  - H=1.5,.....Pihlite, 167
  - H=2.5—3,.....Phlogopite, 124
  - H=3.5—4.5,.....Euphyllite, 184
- B. B. exfoliates,*
  - H=1—1.5,.....Talc, 165
  - H=2—3,.....Penninite, 187
- Reacts alkaline after ignition.
  - H=2.5,.....Brucite, 88
  - H=4—5,..Yttrocerite, 59
- Not included above.
  - H=1—2. Streak black,.....Graphite, 15
  - H=1—2. Streak uncolored, greenish,..Prochlorite, 189
  - H=2—2.5. Streak uncolored, greenish,..Ripidolite, 188
  - H=2.5—4. Streak white, slightly shining, Serpentine, 171
  - H=3—4. Streak bluish black,.....Warwickite, 220
  - H=4.5—5. Streak white, B. B. with soda gives zinc coating on coal,.....Calamine, 151
  - H=4—5. Streak uncolored, greenish or grayish, Seybertite, 194
  - H=5.5—6.5. Streak white,.....Opal, 99

50.
- Pulverulent or earthy,.....Tungstite, 95
- H=1—2. Color black, soils paper,.....Graphite, 15
- H=1—1.5.Micaceous structure,.....Pihlite, 167
- H=1—1.5.Not black or micaceous,.....Talc, 165
- H=2—3. Micaceous structure.
  - Iron reaction,.....Biotite, 125
  - No iron reaction,.....Phlogopite, 124

*Ripidolite from Williamantic, Ct., also exfoliates when heated.—*Dana.*

51.
- Soluble in hydrochloric acid,.....Apatite, 198
- Soluble with difficulty in hydrochloric acid,..Monazite, 201
- Partly soluble in hydrochloric acid, leaving yellow residue,.....Hubnerite, 222
- Gelatinizes in hydrochloric acid.
  - Fluorine reaction,.....Chondrodite, 137
  - No fluorine reaction, B. B. whitens, Chrysolite, 111
  - No fluorine reaction; B. B. not whiten,.....Fosterite, 110
- Not acted upon by hydrochloric acid.
  - Luster metallic or submetallic.
    - Color black,.....Columbite, 196
    - Color whitish steel gray, Platinum, 3
    - Color tin white; light steel gray,.....Iridosmine, 4
  - Phosphorescent when gently heated; becomes glassy, transparent on ignition,.....Petalite, 107
  - Powdered and moistened with sulphuric acid colors flame green, B. B..Xenotime, 197
  - With soda on coal fuses to a bead.
    - Luster vitreous,..Orthoclase, 136
    - Luster not vitrerous.
      - Streak pale brown, Rutile, 76
      - Str'k uncol'red or grayish yellow.
        - Brookite,* 81
        - Octahedrite, 77
  - With little soda fuses to a bead; more a slag,.....Enstatite, 100
  - With soda fuses to a slag,.....Microlite, 195

*See Appendix 4.

52. Decomposed by hydrochloric a'id, gelatinizing
- B. B. whitens,....Chrysolite, 111
- B. B. not changed, Fosterite, 110

Not acted upon by hydrochloric acid.

B. B. with soda gives slag or not acted upon.
- With soda fuses to a bead.
  - Cleavage basal,....Beryl, 109
  - Cleavage none,...Quartz, 98
- With little soda fuses to a bead; with more to a slag,.....Tourmaline. 138
- B. B. fine powdered wholly consumed, Diamond, 14
- Fused on coal with mixture of borax and soda gives zinc coating,...Gahnite, 70
- B. B. loses transparency,.....Iolite, 123
- B. B. unaltered.
  - Color green, greenish white, Chrysoberyl, 74
  - Color red, blue, yellow, brown, gray,.....Corundum, 66
  - Color black
    - Octahedral crystals, Spinel, 69
    - Not octahedral, Staurolite, 145
  - White or colorless,.....Zircon, 116
- B. B. colors grow lighter.
  - Luster vitreous, Tourmaline, 138
  - Luster adamantine, Zircon, 116
- B. B. colors grow darker. Lighter varieties of Spinel and Staurolite—see a few lines above.

TABLE III.

DESCRIPTION OF SPECIES.

(For abbreviations see page 18. For Blow-pipe reactions see page 10.)

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
1	Gold,	1	Hackly.	15.6 to 19.5	2.5 to 3	Metallic.	Yellow.	Yellow.	Soluble in aqua regia.	Fusible.
2	Silver,	1	Hackly,	10.1 to 11.1	2.5 to 3	Metallic.	Silver white.	Silver white.	Soluble in nitric acid.	Fusible.
3	Platinum,	1	Hackly.	16 to 19	4 to 4.5	Metallic.	Whitish steel gray.	Whitish steel gray.	Soluble in aqua regia.	Infusible.
4	Iridosmine,	6	Uneven.	19 to 21	6 to 7	Metallic.	Tin white.	Tin white.	Insoluble.	Infusible.
5	Mercury,	1		13.56	-1	Metallic.		Tin white.	Soluble.	Volatile.
6	Gold Amalgam,					Metallic.	White, yellowish white.	White, yellowish white.	Partly soluble in nitric acid.	Fusible. Partly volatilizes.
7	Copper,	1	Hackly.	8.9	2.5 to 3	Metallic.	Metallic, shining.	Copper red.	Soluble.	Fusible.
8	Iron,	1	Hackly.	7.3 to 7.8	4.5	Metallic.	Gray, shining.	Iron gray.	Soluble.	Infusible.
9	Tin,	2	Hackly.	7.1 to 7.3	3	Metallic.	Tin white, shining.	Tin white.	Soluble.	Fusible.

No.	Name.	Cleavage.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
10	Arsenic,	6	Uneven, granular.	5.9	3.5	Sub-metallic.	Tin white.	Tin white.	Soluble in nitric acid.	Volatilizes. Garlic odor.
11	Antimony,	6	Uneven.	6.6 to 6.7	3 to 3.5	Metallic.	Tin white.	Tin white.	Soluble in aqua regia.	Fusible. Antimony.
12	Bismuth,	6		9.7	2 to 2.5	Metallic.	Silver white, reddish.	Silver white, reddish.	Soluble in nitric acid.	Fusible. Volatile. Bismuth.
13	Sulphur,	2	Conchoidal.	2	1.5 to 2.5	Resinous.	Same as color.	Yellow, sometimes reddish or greenish.	Insoluble.	Fuses. Burns.
14	Diamond,	1	Conchoidal.	3.5	10	Adamantine.		Colorless, yellow, red, orange, green, blue, brown, black.	Not acted on.	Infusible. Fine powder burns.
15	Graphite,	6	Lamellar.	2	1 to 2	Metallic.	Black, shining.	Black, steel gray,	Not acted on.	Infusible. Fine powder burns.
16	Orpiment,	6		3.4	1.5 to 2	Pearly, resinous.	Yellow.	Yellow.	Soluble in aqua regia.	Fusible. Volatile. Sulphur. Arsenic.
17	Stibnite,	3	Sub-conchoidal.	4.5 to 4.6	2	Metallic.	Lead gray.	Lead gray, tarnishes.	Soluble in hydrochloric acid.	Fusible. Sulphur. Antimony.
18	Bismuthinite	3	Conchoidal.	6.4	2	Metallic.	Lead gray, tin white.	Lead gray, tin white.	Soluble in nitric acid.	Fusible. Sulphur. Bismuth.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
19	Tetradymite,	6	Uneven.	7.2 to 7.9	1.5 to 2	Metallic, splendent.	Steel gray.	Steel gray.	Soluble in nitric acid.	Fusible. Volatile. Tellurium. Bismuth.
20	Molybdenite,	?		4.4 to 4.8	1 to 1.5	Metallic.	Lead gray or greenish.	Lead gray.	Decomposed by nitric acid.	Infusible. Sulphur. Molybdenum.
21	Domeykite,		Uneven.	7 to 7.5	3 to 3.5	Metallic, often dull.	White or gray.	Tin white, steel gray, brownish.	Soluble in nitric acid.	Fusible. Arsenic. Copper.
22	Algodonite,		Sub-conchoidal.	7.6	2 to 2.5	Metallic, often dull.	Nearly as color.	Steel gray, silver white.	Soluble in nitric acid.	Fusible. Arsenic. Copper.
23	Whitneyite,			8.2 to 8.4	3.5	Dull or submetallic.	Reddish white.	Reddish to grayish white.	Soluble in nitric acid.	Fusible. Arsenic. Copper.
24	Argentite	1	Sub-conchoidal, uneven.	7.1 to 7.3	2 to 2.5	Metallic.	Same as color but shining.	Blackish lead gray.	Partly soluble in nitric acid.	Fusible. Sulphur. Silver.
25	Galenite,	1	Sub-conchoidal, even.	7.2 to 7.7	2.5	Metallic.	Lead gray.	Lead gray	Partly soluble in nitric acid.	Fusible. Sulphur. Lead.
26	Bornite,	1	Conchoidal, uneven.	4.4 to 5.5	3	Metallic.	Pale grayish black.	Copper red to brown.	Partly soluble in nitric acid.	Fusible. Sulphur. Iron. Copper.
27	Sphalerite,	1	Conchoidal.	3.9 to 4.2	3.5 to 4	Resinous, adamantine.	White to reddish brown.	White, yellow, brown, black, red, green.	Soluble in hydrochloric acid.	Fuses with difficulty. Sulphur. Zinc.

No.	Name.	Sys.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
28	Hessite,	3	Even.	8.3 to 8.6	2 to 3.5	Metallic.	Lead gray, steel gray.	Lead gray, steel gray.	Soluble in nitric acid.	Fusible. Tellurium. Silver.
29	Chalcocite,	3	Conchoidal.	5.5 to 5.8	2.5 to 3	Metallic.	Blackish lead gray.	Blackish lead gray.	Soluble in nitric acid.	Fusible. Sulphur. Copper.
30	Stromeyerite	3	Sub-conchoidal.	6.2 to 6.3	2.5 to 3.5	Metallic.	Dark steel gray, shining.	Dark steel gray.	Soluble in nitric acid.	Fusible. Sulphur. Copper.
31	Cinnabar,	6	Sub-conchoidal, uneven.	8.9	2 to 2.5	Adamantine, metallic.	Scarlet.	Red to lead gray.	Soluble in aqua regia.	Volatile. Sulphur. Mercury.
32	Millerite,	6	Uneven.	4.6 to 5.6	3 to 3.5	Metallic.	Bright.	Brass to bronze yellow.	Soluble in aqua regia.	Fusible. Sulphur. Nickel.
33	Pyrrhotite,	6	Sub-conchoidal.	4.4 to 4.6	3.5 to 4.5	Metallic.	Grayish black.	Bronze yellow, copper red.	Soluble in hydrochloric acid.	Fusible. Sulphur. Iron.
34	Greenockite,	6		4.8	3 to 3.5	Adamantine.	Orange yellow to brick red.	Yellow, orange yellow, bronze yellow.	Soluble in hydrochloric acid.	Infusible. Sulphur. Cadmium.
35	Niccolite,	6	Uneven.	7.3 to 7.6	5 to 5.5	Metallic.	Brownish black.	Pale copper red. Tarnishes.	Soluble in aqua regia.	Fusible. Arsenic. Nickel.
36	Breithauptite	6	Uneven.	7.5	5.5	Metallic.	Reddish brown.	Copper red to violet.	Decomposed by nitric acid.	Fusible. Antimony. Nickel.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
37	Pyrite,	1	Conchoidal, uneven.	4.8 to 5.2	6 to 6.5	Metallic.	Greenish or brownish black.	Brass yellow.	Decomposed by nitric acid.	Fusible. Sulphur. Iron.
38	Chalcopyrite,	2	Conchoidal, uneven.	4.1 to 4.3	3.5 to 4	Metallic.	Greenish black.	Brass yellow, tarnishes.	Decomposed by nitric acid.	Fusible. Sulphur. Copper. Iron.
39	Barnhardtite,		Conchoidal, uneven.	4.5	3.5	Metallic.	Grayish black.	Bronze yellow.	Decomposed by nitric acid.	Fusible. Sulphur. Iron. Copper.
40	Linnaeite,	1	Uneven, subconchoidal.	4.8 to 5	5.5	Metallic.	Blackish gray.	Steel gray, tarnishing copper red.	Decomposed by nitric acid.	Fusible. Sulphur. Cobalt. Iron.
41	Smaltite,	1	Granular, uneven.	6.4 to 7.2	5.5 to 6	Metallic.	Grayish black.	Tin white to steel gray.	Decomposed by nitric acid.	Fusible. Arsenic. Cobalt. Iron.
42	Gersdorffite,	1	Uneven.	5.6 to 6.9	5.5	Metallic.	Grayish black.	Silver white, steel gray.	Decomposed by nitric acid.	Fusible. Sulphur. Arsenic. Iron.
43	Marcasite,	3	Uneven.	4.6 to 4.8	6 to 6.5	Metallic.	Grayish or brownish black.	Bronze yellow.	Decomposed by nitric acid.	Fusible. Sulphur. Iron.
44	Leucopyrite,	3	Uneven.	6.8 to 8.7	5 to 5.5	Metallic.	Grayish black.	Silver white to steel gray.	Decomposed by nitric acid.	Fusible. Arsenic. Iron.
45	Arsenopyrite.	3	Uneven.	6 to 6.4	5.5 to 6	Metallic.	Grayish black.	Silver white to steel gray.	Decomposed by nitric acid.	Fusible. Sulphur. Arsenic. Iron.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
46	Berthierite,			4 to 4.3	2 to 3	Metallic.	Iron black.	Steel gray to brown.	Soluble in hydrochloric acid.	Fusible. Sulphur. Antimony. Iron.
47	Pyrargyrite,	6	Conchoidal.	5.7 to 5.9	2 to 2.5	Metallic, adamantine.	Cochineal red.	Black to cochineal red.	Decomposed by nitric acid.	Fusible. Sulphur. Antimony. Silver.
48	Proustite,	6	Conchoidal, uneven.	5.4 to 5.5	2 to 2.5	Adamantine.	Cochineal red.	Cochineal red.	Decomposed by nitric acid.	Fusible. Sulphur. Arsenic. Silver.
49	Aikinite,	3	Uneven.	6.1 to 6.8	2 to 2.5	Metallic.	Lead gray.	Lead gray, copper red, tarnishes.	Decomposed by nitric acid.	Fusible. Sulphur. Copper.
50	Tetrahedrite,	1	Sub-conchoidal, uneven.	4.5 to 5.1	3 to 4.5	Metallic.	Same as color.	Flint gray to iron black.	Decomposed by nitric acid.	Fusible. Sulphur. Antimony, Iron. Copper.
51	Geocronite,	3	Uneven.	6.4 to 6.6	2 to 3	Metallic.	Lead gray, grayish blue.	Lead gray, grayish blue.	Decomposed by hydrochloric acid.	Fusible. Sulphur. Antimony. Lead.
52	Stephanite,	3	Uneven.	6.2	2 to 2.5	Metallic.	Iron black.	Iron black.	Decomposed by nitric acid.	Fusible. Sulphur. Antimony. Silver.
53	Polybasite,	3	Uneven.	6.2	2 to 3	Metallic.	Iron black.	Iron black.	Decomposed by nitric acid.	Fusible. Sulphur. Antimony. Copper. Silver.
54	Enargite,	3	Uneven.	3.4	3	Metallic.	Grayish black.	Grayish to iron black.	Soluble in aqua regia.	Fusible. Sulphur. Arsenic. Copper.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
55	Halite,	1	Conchoidal.	2.1 to 2.2	2.5	Vitreous.	White.	White, often tinted.	Soluble in water.	Fusible. Sodium.
56	Cerargyrite,	1	Conchoidal.	5.5	1 to 1.5	Resinous, adamantine.	Shining.	Gray, green, whitish.	Insoluble.	Fusible. Silver.
57	Iodyrite,	6	Conchoidal.	5.5 to 5.7	1 to 1.5	Resinous, adamantine.	Yellow.	Yellow, brownish.	Soluble.	Fusible. Iodine. Silver.
58	Fluorite,	1	Conchoidal, uneven.	3 to 3.2	4	Vitreous.	White.	White, yellow, green, rose, blue, brown.	Soluble in sulphuric acid.	Fusible. Fluorine.
59	Yttrocerite,		Uneven.	3.4	4 to 5	Vitreous, pearly.	White.	Blue, gray, white, reddish brown.	Soluble in hydrochloric acid.	Infusible. Water.
60	Cryolite,		Uneven.	2.9 to 3	2.5	Vitreous, pearly.	White.	White, red, brown, black.	Soluble in sulphuric acid.	Fusible. Fluorine.
61	Cuprite,	1	Conchoidal, uneven.	5.8 to 6.1	3.5 to 4	Adamantine, sub-metallic, earthy.	Brownish red.	Red.	Soluble in hydrochloric acid.	Fusible. Copper.
62	Water,									
63	Zincite,	6	Sub-conchoidal.	5.4 to 5.7	4 to 4.5	Sub-adamantine.	Orange yellow.	Red, orange yellow.	Soluble.	Infusible. Zinc.

									of Acids.	
64	Massicot,	3		8 to 9.3	2	Dull.	Lighter than color.	Yellow, reddish.	Soluble in nitric acid.	Fusible. Lead.
65	Melaconite,	1		6.2	3	Metallic.	Gray, black.	Iron gray to black.	Soluble in nitric acid.	Infusible. Copper.
66	Corundum,	6	Conchoidal, uneven.	3.9 to 4.1	9	Vitreous.	Uncolored.	Blue, red, yellow, brown, gray.	Not acted on.	Infusible. Aluminum.
67	Hematite,	6	Sub-conchoidal, uneven.	4.5 to 5.3	5.5 to 6.5	Metallic.	Red, reddish brown.	Steel gray, iron black.	Soluble in hydrochloric acid.	Infusible. Iron.
68	Menaccanite,	6	Conchoidal.	4.5 to 5	5 to 6	Sub-metallic.	Sub metallic, black to brownish red.	Iron black.	Slowly soluble in hydrochloric acid.	Infusible. Iron. Titanium
69	Spinel,	1	Conchoidal.	3.5 to 4.1	8	Vitreous.	White.	Red, blue, green, yellow, brown, black.	Slowly soluble in sulphuric acid.	Infusible.
70	Gahnite,	1	Conchoidal.	4 to 4.6	7.5 to 8	Vitreous.	Grayish.	Green, black, brown, yellowish, bluish.	Slowly soluble in sulphuric acid.	Infusible. Zinc.
71	Magnetite,	1	Sub-conchoidal.	4.9 to 5.2	5.5 to 6.5	Metallic, submetallic.	Black.	Iron black.	Soluble in hydrochloric acid.	Fuses with difficulty. Iron.
72	Franklinite,	1	Conchoidal.	5	5.5 to 6.5	Metallic.	Reddish brown.	Iron black.	Soluble in hydrochloric acid.	Infusible. Iron. Manganese. Zinc.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
73	Chromite,	1	Uneven.	4.3 to 4.5	5.5	Sub-metallic.	Brown.	Iron black, brownish black.	Not acted on.	Infusible. Iron. Chromium.
74	Chrysoberyl,	3	Conchoidal, uneven.	3.5 to 3.8	8.5	Vitreous.	Uncolored.	Green, greenish white.	Not acted on.	Iufusible. Aluminum.
75	Cassiterite,	2	Sub-conchoidal, uneven.	6.4 to 7.1	6 to 7	Adamantine.	White, grayish, brownish.	Brown, black, red, grey, white, yellow.	Slightly acted on.	Iufusible. Tin.
76	Rutile,	2	Sub-conchoidal, uneven.	4.1 to 4.2	6 to 6.5	Metallic, adamantine.	Pale brown.	Reddish brown, red, black, yellowish, bluish.	Insoluble.	Infusible. Titanium.
77	Octahedrite,	2	Sub-conchoidal.	3.8 to 3.9	5.5 to 6	Metallic, adamantine.	Uncolored.	Brown, blue, black.	Insoluble.	Infusible. Titanium.
78	Hausmannite,	2	Uneven.	4.7	5 to 5.5	Sub-metallic.	Brown.	Brownish black.	Soluble in hydrochloric acid.	Infusible. Manganese.
79	Braunite,	2	Uneven.	4.7 to 4.8	6 to 6.5	Sub-metallic.	Brownish black.	Brownish black.	Soluble in hydrochloric acid.	Infusible. Manganese.
80	Minium,			4.6	2 to 3	Greasy, dull.	Orange yellow.	Red mixed with yellow.	Partly soluble in nitric acid.	Fusible. Lead.
81	Brookite,	3	Uneven.	4.1 to 4.2	5.5 to 6	Metallic, adamantine.	Uncolored, grayish, yellowish.	Brown, red, yellow, black.	Insoluble.	Infusible. Titanium.

No.	Name.	Cleavage.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
82	Pyrolusite,	3	Uneven.	4.8	2 to 2.5	Metallic.	Black, bluish black.	Iron black, steel gray.	Soluble in hydrochloric acid.	Infusible. Manganese.
83	Turgite,			3.5 to 4.6	5 to 6	Sub-metallic, dull.	Red.	Red, reddish black.	Soluble in hydrochloric acid.	Infusible. Iron. Water.
84	Diaspore,	3	Uneven.	3.3 to 3.5	6.5 to 7	Vitreous, pearly.	White, gray.	White, grayish, greenish, yellowish, brown.	Not acted on.	Infusible. Aluminum. Water at high temperature.
85	Goethite,	3	Uneven, conchoidal.	4 to 4.4	5 to 5.5	Imperfect adamantine.	Brownish yellow, ochre yellow.	Yellowish, reddish, blackish, brown.	Soluble in hydrochloric acid.	Infusible. Iron. Water.
86	Manganite,	3	Uneven.	4.2 to 4.4	4	Sub-metallic.	Reddish brown.	Steel gray, black.	Soluble in hydrochloric acid.	Iufusible. Manganese. Water.
87	Limonite,		Fibrous, earthy.	3.6 to 4	5 to 5.5	Silky, sub-metallic, earthy.	Yellowish brown.	Dark brown.	Soluble in hydrochloric acid.	Infusible. Iron. Water.
88	Brucite,	6	Uneven.	2.3 to 2.4	2.5	Pearly.	White.	White, gray, blue, green.	Soluble.	Infusible. Magnesium. Water.
89	Gibbsite,	6		2.3 to 2.4	2.5 to 3.5	Pearly, vitreous.	White.	White, grayish, greenish, reddish.	Soluble in sulphuric acid.	Infusible. Aluminum. Water.
90	Hydrotalcite,	6		2	2	Pearly.	White.	White.	Soluble in hydrochloric acid.	Iufusible. Magnesium. Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
91	Psilomelane,		Uneven.	3.7 to 4.7	5 to 6	Sub-metallic.	Brownish black.	Iron black, steel gray.	Soluble in hydrochloric acid.	Infusible. Manganese. Water from most varieties.
92	Wad,		Uneven.	3 to 3.2	0.5 to 6	Metallic, earthy.	Brown.	Black, bluish or brownish black.	Soluble in hydrochloric acid.	Infusible. Manganese. Water from most varieties.
93	Arsenolite,	1	Conchoidal.	3.6	1.5	Vitreous, silky.	White, yellowish.	White, yellowish, reddish.	Slightly soluble in hot water.	Volatile. Arsenic.
94	Molybdite,	3	Earthy.	4.4 to 4.5	1 to 2	Silky to adamantine, earthy.	Yellow.	Yellow.	Soluble in hydrochloric acid.	Fusible. Molybdenum.
95	Tungstite,				1	Dull.	Yellow.	Yellow, yellowish green.	Insoluble.	Infusible. Tungsten.
96	Cervantite,	3		4	4 to 5	Pearly, earthy.	Yellowish white, white.	Yellow, white, reddish white.	Soluble in hydrochloric acid.	Infusible. Antimony.
97	Partzite,		Conchoidal.	3.8	3 to 4	Pearly, earthy.	Green.	Green, black.	Soluble in hydrochloric acid.	Infusible. Antimony. Water.
98	Quartz,	6	Conchoidal.	2.5 to 2.8	7	Vitreous, resinous.	White, often same as color.	Colorless, white, red, yellow, blue, brown, green, black.	Not acted on.	Infusible. Silicon.
99	Opal,		Conchoidal.	1.9 to 2.3	5.5 to 6.5	Vitreous, resinous, pearly.	White.	White, red, yellow, brown, green, gray.	Insoluble.	Infusible. Silicon. Water.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
100	Enstatite,	3		3.1 to 3.3	5.5	Pearly, vitreous.	Uncolored, grayish.	Grayish or yellowish white, green, brown.	Insoluble.	Almost infusible.
101	Hypersthene,			3.39	5 to 6	Pearly.	Grayish, brownish gray.	Brownish green, black, brown.	Partly decomposed by hydrochloric acid.	Fusible. Iron.
102	Wollastonite,	4	Uneven.	2.7 to 2.9	4.5 to 5	Vitreous, pearly.	White.	White, red, yellow, gray, brown.	Gelatinizes in hydrochloric acid.	Fusible.
103	Pyroxene,	4	Conchoidal, uneven.	3.2 to 3.5	5 to 6	Vitreous, resinous, pearly.	White, gray, grayish green.	White through green to black.	*	Fusible.
104	Rhodonite,	5	Conchoidal, uneven.	3.4 to 3.6	5	Vitreous.	White.	Red, greenish, yellowish.	Partly soluble in hydrochloric acid.	Fusible. Manganese.
105	Babingtonite,	5	Conchoidal.	3.3	5.5 to 6	Vitreous.	White.	Greenish black.	Not acted on.	Fusible. Iron. Manganese.
106	Spodumene,	4	Uneven.	3.1	6.5 to 7	Pearly, vitreous.	Uncolored.	Grayish green, white.	Not acted on.	Fusible. Lithium.
107	Petalite,	4	Conchoidal.	2.3 to 2.5	6 to 6.5	Pearly, vitreous.	Uncolored.	Colorless, white, gray.	Not acted on.	Fusible. Lithium.
108	Amphibole,	4	Sub-conchoidal, uneven.	2.9 to 3.4	5 to 6	Vitreous, pearly, silky.	White or paler than color.	White through green to black.	*	Fusible.

*Some varieties slightly acted upon by acid, others not. See Appendix 11 and 1.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
109	Beryl,	6	Conchoidal, uneven.	2.6 to 2.7	7.5 to 8	Vitreous, resinous.	White.	Green, blue, yellow, white.	Not acted on.	Difficultly fusible.
109 a	Eudialite,	6	Sub-conchoidal, splintery.	2.9 to 3	5.5	Vitreous.	Uncolored.	Various shades of red.	Gelatinizes in hydrochloric acid.	Fusible. Sodium. Iron. Manganese.
110	Fosterite,	3	Conchoidal.	3.2 to 3.3	6 to 7	Vitreous.	Uncolored.	White, gray, yellow, bluish, greenish.	Gelatinizes in hydrochloric acid.	Infusible.
111	Chrysolite,	3	Conchoidal.	3.3 to 3.5	6 to 7	Vitreous.	Uncolored, yellowish.	Green, brownish, grayish red.	Gelatinizes in hydrochloric acid.	Infusible. Iron.
112	Tephroite,	3	Conchoidal.	4 to 4.1	5.5 to 6	Adamantine.	Pale gray.	Red, brown, gray.	Gelatinizes in hydrochloric acid.	Fusible. Iron. Manganese.
113	Willemite,	6	Conchoidal.	3.8 to 4.1	5.5	Vitreo-resinous.	Uncolored.	White, yellow, green, red, brown.	Gelatinizes in hydrochloric acid.	Difficultly fusible. Zinc.
114	Danalite,	1	Sub-conchoidal.	3.4	5.5 to 6	Vitreo-resinous.	Lighter than color.	Flesh red, gray.	Gelatinizes in hydrochloric acid.	Fusible. Zinc.
115	Garnet,	1	Sub-conchoidal, uneven.	3.1 to 4.3	6.5 to 7.5	Vitreous, resinous.	White.	Red, brown, green, white, black, yellow.	Some varieties partly decomposed.	Fusible.
116	Zircon,	2	Conchoidal.	4 to 4.7	7.5	Adamantine.	Uncolored.	Colorless, red, brown, yellow, green, pink.	Not acted on.	Infusible.

No.	Name.	Cl.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
117	Vesuvianite,	3	Sub-conchoidal, uneven.	3.3 to 3.4	6.5	Vitreous, resinous.	White.	Brown, green, blue, yellow.	Partly decomposed by hydrochloric acid.	Fusible. Iron.
118	Epidote,	4	Uneven.	3.2 to 3.5	6 to 7	Vitreous, pearly.	Uncolored, grayish.	Green, yellow, brown, black, red, gray.	Gelatinizes.	Fusible. Iron.
119	Allanite,	4	Sub-conchoidal, uneven.	3 to 4.2	5.5 to 6	Sub-metallic, pitchy, resinous.	Gray, greenish, brownish.	Brown, black, greenish, yellowish, grayish,	Gelatinizes in hydrochloric acid.	Fusible. Iron.
120	Zoisite,	3		3.1 to 3.3	6 to 6.5	Pearly, vitreous.	Uncolored.	White, gray, yellow, brown, green, red.	Insoluble.	Fusible.
121	Axinite,	5	Conchoidal.	3.2	6.5 to 7	Glassy.	Uncolored.	Brown, blue, gray.	Insoluble.	Fusible. Boron. Manganese. Iron.
122	Danburite,	5		2.9	7	Vitreous.	White.	Yellow, whitish.	Slightly soluble.	Fusible. Boron.
123	Iolite,	3	Sub-conchoidal.	2.5 to 2.6	7 to 7.5	Vitreous.	Uncolored.	Blue, green, yellow, gray, brown.	Partly decomposed.	Difficultly fusible.
124	Phlogopite,	3	Lamellar.	2.7 to 2.8	2.5 to 3	Pearly, sub-metallic.	Uncolored.	Yellowish brown, brownish red, green, white.	Decomposed by sulphuric acid.	Fusible.
125	Biotite,	6	Lamellar.	2.7 to 3.1	2.5 to 3	Vitreous. splendent, sub-metallic.	Uncolored.	Green, black, brown, red, white.	Decomposed by sulphuric acid.	Fusible. Iron.

No.	Name.	Cl.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
126	Muscovite,	3	Lamellar.	2.7 to 3.1	2 to 2.5	Pearly.	Uncolored.	White, gray, violet, black, red, brown, green, yellow.	Insoluble.	Difficultly fusible. Iron.
127	Lepidolite,	3	Lamellar.	2.8 to 3	2.5 to 3	Pearly.	Uncolored.	Red, gray, lilac, white, green.	Attacked by acids.	Fusible. Fluorine. Lithium.
128	Cryophylite,	3	Lamellar.	2.9	2 to 2.5	Pearly, resinous.	Grayish, greenish.	Green, brownish red.	Decomposed.	Fusible. Lithium.
129	Wernerite,	2	Sub-conchoidal.	2.6 to 2.8	5 to 6	Vitreous, pearly, resinous.	Uncolored.	White, gray, bluish, greenish, reddish.	Partly soluble in hydrochloric acid.	Fusible.
130	Ekebergite,	2	Sub-conchoidal.	2.7	5.5 to 6	Vitreous, pearly.	Uncolored,	White, gray, greenish, bluish, reddish.	Partly soluble in hydrochloric acid.	Fusible.
131	Nephelite,	6	Sub-conchoidal.	2.5 to 2.6	5.5 to 6	Vitreous, greasy.	Same as color.	Colorless, white, yellow, gray, green, brown, red.	Gelatinizes.	Fusible.
132	Sodalite,	1	Conchoidal, uneven.	2.1 to 2.4	5.5 to 6	Vitreous.	Uncolored.	Gray, white, blue, red.	Gelatinizes.	Fusible.
133	Labradorite,	5	Conchoidal, uneven.	2.6 to 2.7	6	Pearly, vitreous.	Uncolored.	Gray, brown, greenish, white.	Decomposed with difficulty by hydrochloric acid.	Fusible.
134	Oligoclase,	5	Conchoidal, uneven,	2.5 to 2.7	6 to 7	Vitreous, pearly.	Uncolored.	White, green, red.	Insoluble.	Fusible.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
135	Albite,	5	Uneven.	2.5 to 2.6	6 to 7	Pearly, vitreous.	Uncolored.	White, blue, gray, green, red.	Insoluble.	Difficultly fusible.
136	Orthoclase,	4	Conchoidal, uneven.	2.4 to 2.6	6 to 6.5	Vitreous, pearly.	Uncolored.	White, red, gray, green.	Insoluble.	Fuses with difficulty.
137	Chondrodite,	3	Sub-conchoidal, uneven.	3.1 to 3.2	6 to 6.5	Vitreous, resinous.	White, yellowish, grayish.	White, yellow, red, brown, green, black.	Gelatinizes.	Infusible. Fluorine. Iron.
138	Tourmaline,	6	Sub-conchoidal, uneven.	2.9 to 3.3	7 to 7.5	Vitreous,	Uncolored.	Black, blue, green, red, white.	Not acted on.	Fusible to infusible. Boron.
139	Andalusite,	3	Sub-conchoidal, uneven.	3 to 3.3	7.5	Vitreous.	Uncolored.	White, red, violet, gray, brown, green.	Insoluble.	Infusible. Aluminum.
140	Fibrolite,	4	Uneven.	3.2 to 3.3	6 to 7	Vitreous.	Uncolored.	Brown, white, green.	Insoluble.	Infusible. Aluminum.
141	Cyanite,	5	Uneven.	3.4 to 3.7	5 to 7.5	Vitreous, pearly.	Uncolored.	Blue, white, gray, green, black.	Insoluble.	Infusible. Aluminum.
142	Topaz,	3	Sub-conchoidal, uneven.	3.4 to 3.6	8	Vitreous.	Uncolored.	Yellow, white, greenish, bluish, reddish.	Partially attacked by sulphuric acid.	Infusible. Aluminum. Fluorine.
143	Datolite,	4	Sub-conchoidal, uneven.	2.8 to 3	5 to 5.5	Vitreous.	White.	White, gray, green, red, yellow.	Gelatinizes in hydrochloric acid.	Fusible. Boron.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
144	Titanite,	4	Sub-conchoidal, uneven.	3.4 to 3.5	5 to 5.5	Adamantine, Vitreous.	White.	Brown, yellow, gray, green, black.	Imperfectly soluble in hydrochloric acid.	Fusible. Titanium.
145	Staurolite,	3	Conchoidal.	3.4 to 3.8	7 to 7.5	Sub-vitreous, resinous.	Uncolored.	Reddish or yellowish brown, black.	Imperfectly soluble in hydrochloric acid.	Infusible. Iron.
146	Schorlomite,		Conchoidal.	3.8	7 to 7.5	Vitreous.	Grayish black.	Black, blue.	Gelatinizes in hydrochloric acid.	Fusible. Iron. Titanium.
147	Pectolite,	4	Fibrous.	2.6 to 2.7	5	Sub-vitreous, silky.	Colorless.	White, gray, brown.	Gelatinizes in hydrochloric acid.	Fusible. Water.
148	Gyrolite,				3 to 4	Vitreous, pearly.	White.	White,	Gelatinizes in hydrochloric acid.	Fuses with difficulty. Water.
149	Laumonite,	4	Uneven.	2.2 to 2.3	3.5 to 4	Vitreous, pearly.	Uncolored.	White, yellow, gray, red.	Gelatinizes in hydrochloric acid.	Fusible. Water.
150	Chrysocolla,		Conchoidal.	2 to 2.2	2 to 4	Vitreous, earthy.	White when pure.	Green, blue, brown, black.	Decomposed.	Infusible. Copper. Water.
151	Calamine,	3	Uneven.	3.1 to 3.9	4.5 to 5	Vitreous, adamantine, pearly.	White.	White, oluish, greenish, yellowish, brown.	Gelatinizes.	Fuses with difficulty. Zinc. Water.
152	Prehnite,	3	Uneven.	2.8 to 2.9	6 to 6.5	Vitreous, pearly.	Uncolored.	Green, white, gray.	Decomposed by hydrochloric acid.	Fusible. Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
153	Chlorastrolite,		Fibrous.	3.1	5.5 to 6	Pearly.	White.	Bluish green.	Decomposed by hydrochloric acid.	Fusible. Water.
154	Apophyllite,	2	Conchoidal, uneven.	2.3 to 2.4	4.5 to 5	Vitreous, pearly.	Uncolored.	White, yellowish, red, greenish.	Decomposed by hydrochloric acid.	Fusible. Potassium. Fluorine. Water.
155	Allophane,		Imperfectly conchoidal.	1.8	3	Vitreous, sub-resinous.	Uncolored.	Blue, green, brown, yellow, colorless.	Gelatinizes in hydrochloric acid.	Infusible. Aluminum. Water.
156	Schrotterite,					Vitreous, sub-resinous.	Uncolored.	Green, white, yellowish.	Decomposed.	Infusible. Aluminum. Water.
157	Thomsonite,	3	Uneven.	2.3 to 2.4	5 to 5.5	Vitreous, pearly.	Uncolored.	White, brown when impure.	Gelatinizes in hydrochloric acid.	Fusible. Water.
158	Natrolite,	3	Conchoidal, uneven.	2.1 to 2.2	5 to 5.5	Vitreous, pearly.	Uncolored.	White, gray, yellow, red.	Gelatinizes.	Fusible. Water.
159	Mesolite,			2.2 to 2.4	5	Vitreous, silky.	White.	White, grayish, yellowish.	Gelatinizes in hydrochloric acid.	Fuses into vermicular forms. Water.
160	Analcite,	1	Sub-conchoidal, uneven.	2.2	5 to 5.5	Vitreous.	White.	Colorless, white, green, blue, red, gray.	Gelatinizes in hydrochloric acid.	Fusible. Water.
161	Chabazite,	6	Uneven.	2 to 2.1	4 to 5	Vitreous.	Uncolored.	White, yellow, red, colorless.	Decomposed by hydrochloric acid.	Fusible. Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
153	Chlorastrolite,		Fibrous.	3.1	5.5 to 6	Pearly.	White.	Bluish green.	Decomposed by hydrochloric acid.	Fusible. Water.
154	Apophyllite,	2	Conchoidal, uneven.	2.3 to 2.4	4.5 to 5	Vitreous, pearly.	Uncolored.	White, yellowish, red, greenish.	Decomposed by hydrochloric acid.	Fusible. Potassium. Fluorine. Water.
155	Allophane,		Imperfectly conchoidal.	1.8	3	Vitreous, sub-resinous.	Uncolored.	Blue, green, brown, yellow, colorless.	Gelatinizes in hydrochloric acid.	Infusible. Aluminum. Water.
156	Schrotterite,					Vitreous, sub-resinous.	Uncolored.	Green, white, yellowish.	Decomposed.	Infusible. Aluminum. Water.
157	Thomsonite,	3	Uneven.	2.3 to 2.4	5 to 5.5	Vitreous, pearly.	Uncolored.	White, brown when impure.	Gelatinizes in hydrochloric acid.	Fusible. Water.
158	Natrolite,	3	Conchoidal, uneven.	2.1 to 2.2	5 to 5.5	Vitreous, pearly.	Uncolored.	White, gray, yellow, red.	Gelatinizes.	Fusible. Water.
159	Mesolite,			2.2 to 2.4	5	Vitreous, silky.	White.	White, grayish, yellowish.	Gelatinizes in hydrochloric acid.	Fuses into vermicular forms. Water.
160	Analcite,	1	Sub-conchoidal, uneven.	2.2	5 to 5.5	Vitreous.	White.	Colorless, white, green, blue, red, gray.	Gelatinizes in hydrochloric acid.	Fusible. Water.
161	Chabazite,	6	Uneven.	2 to 2.1	4 to 5	Vitreous.	Uncolored.	White, yellow, red, colorless.	Decomposed by hydrochloric acid.	Fusible. Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
162	Stilbite,	3	Uneven.	2 to 2.2	3.5 to 4	Vitreous, pearly.	Uncolored.	White, yellow, red, brown.	Decomposed by hydrochloric acid.	Fuses into vermicular forms. Water.
163	Epistilbite,	3	Uneven.	2.2 to 2.3	4 to 4.5	Vitreous, pearly.	Uncolored.	White, bluish, reddish, yellowish.	Suluble in hydrochloric acid.	Fuses and intumesces. Water.
164	Heulandite,	4	Sub-conchoidal, uneven.	2.2	3.5 to 4	Pearly, vitreous.	White.	White, red, gray, brown.	Decomposed by hydrochloric acid.	Fuses into vermicular forms. Water.
165	Talc,	3	Scaly, earthy.	2.5 to 2.8	1 to 1.5	Pearly.	White or lighter than color.	Blue, green, red, gray, brown, white.	Insoluble.	Fuses with difficulty. Magnesium. Water from some varieties.
166	Pyrophyllite,	3	Scaly, earthy.	2.7 to 2.9	1 to 2	Pearly, dull.	White or lighter than color.	White, green, yellow, grayish white.	Partly decomposed by sulphuric acid.	Fuses with difficulty. Aluminum. Water.
167	Pihlite,		Scaly.	2.7	1.5	Pearly, satin.	White.	White, yellowish.	Insoluble.	Fuses with difficulty. Aluminum. Water at high temperature.
168	Smectite,			1.9 to 2.1	1	Dull.	Colorless.	White, green, gray, brownish.	Decomposed by hydrochloric acid.	Fusible. Water.
169	Stilpnomelane,	6		2.7 to 3.4		Pearly, vitreous, brassy.	Greenish.	Black, greenish, bronze.	One variety decomposed.	Fusible. Iron. Water.
170	Glauconite,			2.2 to 2.4	2	Dull.	Green.	Green.	Some varieties decomposed.	Fusible. Iron. Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
171	Serpentine,		Conchoidal, splintery.	2.5 to 2.6	2.5 to 4	Resinous, pearly, earthy.	White, gray.	Green, red, yellow.	Decomposed by hydrochloric acid.	Fuses with difficulty. Water.
172	Deweylite,			2.1 to 2.3	2 to 2.5	Greasy.	Uncolored.	White, yellow, greenish, reddish.	Decomposed by hydrochloric acid.	Fuses with difficulty. Water.
173	Cerolite,			2.3 to 2.4	2 to 2.5	Vitreous, resinous.	Uncolored.	White, yellow, reddish.	Insoluble.	Infusible. Blackens. Water.
174	Hydrophite,			2.4 to 2.6	2.5 to 3.5	Sub-vitreous.	Paler than color.	Green.	Decomposed by acids.	Fusible. Iron. Manganese. Water.
175	Genthite,			2.4	1 to 4	Resinous.	Greenish white.	Green, yellowish.	Decomposed by hydrochloric acid.	Fusible. Nickel. Water.
176	Saponite,			2.2	1	Greasy.	White or lighter than color.	White, green, bluish, reddish.	Decomposed by sulphuric acid.	Fuses with difficulty. Blackens. Water.
177	Pholerite,	3	Scaly.	2.3 to 2.5	1 to 2.5	Pearly.	White or lighter than color.	White, brown, violet, greenish, yellowish.	Insoluble.	Infusible. Aluminum. Water.
178	Kaolinite,	3		2.4 to 2.6	1 to 2.5	Pearly, earthy.	White or lighter than color.	White, yellowish, brownish, bluish, reddish.	Insoluble.	Infusible. Aluminum. Water.
179	Halloysite,		Conchoidal.	1.8 to 2.4	1 to 2	Pearly, dull.	White or lighter than color.	White, yellowish, greenish, bluish, reddish.	Decomposed.	Infusible. Aluminum. Water.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
162	Stilbite,	3	Uneven.	2 to 2.2	3.5 to 4	Vitreous, pearly.	Uncolored.	White, yellow, red, brown.	Decomposed by hydrochloric acid.	Fuses into vermicular forms. Water.
163	Epistilbite,	3	Uneven.	2.2 to 2.3	4 to 4.5	Vitreous, pearly.	Uncolored.	White, bluish, reddish, yellowish.	Suluble in hydrochloric acid.	Fuses and intumesces. Water.
164	Heulandite,	4	Sub-conchoidal, uneven.	2.2	3.5 to 4	Pearly, vitreous.	White.	White, red, gray, brown.	Decomposed by hydrochloric acid.	Fuses into vermicular forms. Water.
165	Talc,	3	Scaly, earthy.	2.5 to 2.8	1 to 1.5	Pearly.	White or lighter than color.	Blue, green, red, gray, brown, white.	Insoluble.	Fuses with difficulty. Magnesium. Water from some varieties.
166	Pyrophyllite,	3	Scaly, earthy.	2.7 to 2.9	1 to 2	Pearly, dull.	White or lighter than color.	White, green, yellow, grayish white.	Partly decomposed by sulphuric acid.	Fuses with difficulty. Aluminum. Water.
167	Pihlite,		Scaly.	2.7	1.5	Pearly, satin.	White.	White, yellowish.	Insoluble.	Fuses with difficulty. Aluminum. Water at high temperature.
168	Smectite,			1.9 to 2.1	1	Dull.	Colorless.	White, green, gray, brownish.	Decomposed by hydrochloric acid.	Fusible. Water.
169	Stilpnomelane,	6		2.7 to 3.4		Pearly, vitreous, brassy.	Greenish.	Black, greenish, bronze.	One variety decomposed.	Fusible. Iron. Water.
170	Glauconite,			2.2 to 2.4	2	Dull.	Green.	Green.	Some varieties decomposed.	Fusible. Iron. Water.

No.	Name.	Cl. Si.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
188	Ripidolite,	4	Lamellar.	2.6 to 2.7	2 to 2.5	Pearly.	Greenish white.	Green, red.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
189	Prochlorite,		Lamellar.	2.7 to 2.9	1 to 2	Pearly.	White, greenish.	Green, red.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
190	Corundophillite,	4	Lamellar.	2.9	2.5	Pearly.	Colorless, greenish.	Green.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
191	Chloritoid,	4 or 5	Lamellar, scaly.	3.5 to 3.6	5.5 to 6	Pearly.	Uncolored, grayish.	Gray, green, black.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
192	Margarite,	3	Lamellar, scaly.	2.9	3.5 to 4.5	Pearly, vitreous.	Uncolored.	White, grayish, reddish, yellowish.	Partially decomposed by sulphuric acid.	Fuses with difficulty. Water.
193	Thuringite,		Sub-conchoidal.	3.1	2.5	Pearly, dull.	Paler than color.	Green.	Gelatinizes in hydrochloric acid.	Fusible. Iron. Water.
194	Seybertite,	3	Lamellar, scaly.	3 to 3.1	4 to 5	Pearly, submetallic.	Uncolored, yellowish, grayish.	Brown, copper red, yellowish.	Acted on when in powder.	Infusible. Water.
195	Microlite,	1		5.4 to 5.5	5.5	Vitreous, resinous.	Paler than color,	Yellow, brown.	Insoluble.	Infusible.
196	Columbite,	3	Sub-conchoidal, uneven.	5.4 to 6.5	6	Sub-metallic.	Dark red, black.	Black.	Insoluble.	Infusible.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
180	Pinite,			2.6 to 2.8	2.5 to 3.5	Dull, waxy.	White or lighter than color.	White, reddish, green, brownish.	Attacked by hydrochloric acid.	Fusible. Water.
181	Palagonite,		Granular.	2.4 to 2.7	4 to 5	Vitreous, greasy.	Yellowish, yellow, brownish.	Yellow, brown, red, black.	Gelatinizes in hydrochloric acid.	Fusible. Iron. Water.
182	Fahlunite,	3	Lamellar.	2.6 to 2.8	3.5 to 5	Pearly, waxy.	Colorless.	Green, brown, black.	Not acted on.	Fusible. Water.
183	Margarodite,	3	Lamellar.	2.7 to 3.1	2 to 2.5	Pearly.	White.	White, silvery.	Insoluble.	Fuses with difficulty. Iron. Water.
184	Euphyllite,		Lamellar.	2.9 to 3	3.5 to 4.5	Pearly, adamantine.	Uncolored.	White, grayish, greenish.	Insoluble.	Fuses with difficulty. Traces of fluorine. Water.
185	Cookeite,		Lamellar.	2.7	2.5	Pearly.	Uncolored.	White, green, yellowish.	Partially decomposed by sulphuric acid.	Fuses with difficulty. Lithium. Aluminum. Water.
185 a	Vermiculite,	6	Scaly.	2.7	1 to 2	Pearly.	Uncolored.	Grayish, brownish.	Gelatinizes in hydrochloric acid.	Fuses and exfoliates. Iron. Water.
186	Jefferisite,		Lamellar.	2.3	1.5	Pearly.	White, gray.	Yellow, brown.	Decomposed by hydrochloric acid.	Fuses and exfoliates. Silicon. Iron. Water.
187	Penninite,	6	Lamellar.	2.6 to 2.8	2 to 2.5	Pearly, vitreous.	White.	Green, red, yellow, white.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.

No.	Name.	Cl.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
188	Ripidolite,	4	Lamellar.	2.6 to 2.7	2 to 2.5	Pearly.	Greenish white.	Green, red.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
189	Prochlorite,		Lamellar.	2.7 to 2.9	1 to 2	Pearly.	White, greenish.	Green, red.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
190	Corundophillite,	4	Lamellar.	2.9	2.5	Pearly.	Colorless, greenish.	Green.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
191	Chloritoid,	4 or 5	Lamellar, scaly.	3.5 to 3.6	5.5 to 6	Pearly.	Uncolored, grayish.	Gray, green, black.	Decomposed by sulphuric acid.	Fuses with difficulty. Iron. Water.
192	Margarite,	3	Lamellar, scaly.	2.9	3.5 to 4.5	Pearly, vitreous.	Uncolored.	White, gravish, reddish, yellowish.	Partially decomposed by sulphuric acid.	Fuses with difficulty. Water.
193	Thuringite,		Sub-conchoidal.	3.1	2.5	Pearly, dull.	Paler than color.	Green.	Gelatinizes in hydrochloric acid.	Fusible. Iron. Water.
194	Seybertite,	3	Lamellar, scaly.	3 to 3.1	4 to 5	Pearly, submetallic.	Uncolored, yellowish, grayish.	Brown, copper red, yellowish.	Acted on when in powder.	Infusible. Water.
195	Microlite,	1		5.4 to 5.5	5.5	Vitreous, resinous.	Paler than color,	Yellow, brown.	Insoluble.	Infusible.
196	Columbite,	3	Sub-conchoidal, uneven.	5.4 to 6.5	6	Sub-metallic.	Dark red, black.	Black.	Insoluble.	Infusible.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
197	Xenotime,	2	Uneven, splintery.	4.4 to 4.5	4 to 5	Resinous.	Pale brown, yellowish, reddish.	Brown, red, yellow, white.	Insoluble.	Infusible. Phosphorus.
198	Apatite,	6	Conchoidal, uneven.	2.9 to 3.2	5	Vitreous, sub-resinous.	White.	Green, blue, white, gray, yellow, red, brown.	Slowly soluble in nitric acid.	Fuses with difficulty. Phosphorus.
199	Pyromorphite,	6	Sub-conchoidal, uneven.	6.5 to 7.1	3.5 to 4	Resinous.	White, yellowish.	Green, yellow, brown, white.	Soluble in nitric acid.	Fusible. Phosphorus. Lead.
200	Mimetite,	6	Sub-conchoidal,	7 to 7.2	3.5	Resinous.	White.	Yellow, brown, white.	Soluble in nitric acid.	Fusible. Arsenic. Lead.
201	Monazite,	4		4.9 to 5.2	5 to 5.5	Resinous.	Lighter than color.	Red, brown.	Difficultly soluble in hydrochloric acid.	Infusible. Phosphorus.
202	Triphylite,	3		3.5 to 3.6	5	Sub-resinous.	Grayish white.	Black, greenish gray, bluish.	Soluble in hydrochloric acid.	Fusible. Phosphorus. Lithium. Iron. Manganese.
203	Amblygonite,	5	Uneven.	3 to 3.1	6	Pearly, vitreous.	White or paler than color.	Green to white.	Soluble in sulphuric acid.	Fusible. Phosphorus. Lithium. Aluminum. Fluorine.
204	Vivianite,	4		2.5 to 2.6	1.5 to 2	Pearly, vitreous.	Colorless, blue.	White, blue, green.	Soluble in hydrochloric acid.	Fusible. Iron. Phosphorus. Water.
205	Erythrite,	4		2.9	1.5 to 2.5	Pearly, adamantine, dull.	Paler than color.	Red, gray, blue.	Soluble in hydrochloric acid.	Fusible. Arsenic. Cobalt. Water.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
206	Annabergite,	4	Uneven, earthy.		1		Greenish white.	Green.	Soluble.	Fusible. Arsenic. Cobalt. Nickel. Water.
207	Pseudomalachite.	3	Conchoidal, uneven.	4 to 4.4	4.5 to 5	Adamantine, vitreous.	Green.	Green.	Soluble in nitric acid.	Fusible. Copper. Phosphorus. Water.
208	Scorodite,	3	Uneven.	3.1 to 3.3	3.5 to 4	Vitreous, sub-adamantine, sub-resinous.	White.	Green, brown.	Soluble in hydrochloric acid.	Fusible. Arsenic. Iron. Water.
209	Lazulite,	4	Uneven.	3 to 3.1	5 to 6	Vitreous.	White.	Blue.	Not acted on.	Infusible. Phosphorus. Aluminum. Iron. Water.
210	Wavelite,	3	Uneven.	2.3	3.25 to 4	Vitreous, pearly, resinous.	White.	White, green, gray, yellow, brown, black.	Soluble in hydrochloric acid.	Infusible. Fluorine. Phosphorus. Aluminum. Water.
211	Childrenite,	3	Uneven.	3.1 to 3.2	4.5 to 5	Vitreous, resinous.	White, yellowish.	Yellowish white, brown, black.	Soluble in hydrochloric acid.	Fuses with difficulty. Phosphorus. Iron. Manganese. Water.
212	Turquois,		Conchoidal.	2.6 to 2.8	6	Waxy.	White, greenish.	Blue, green.	Soluble in hydrochloric acid.	Infusible. Phosphorus. Water.
213	Autunite,	3		3 to 3.1	2 to 2.5	Pearly, subadamantine.	Yellowish.	Yellow.	Soluble in nitric acid.	Fusible. Phosphorus. Water.
214	Nitre,	3	Conchoidal.	1.9	2	Vitreous.	White.	White.	Soluble in water.	Fusible. Potassium.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
215	Nitrocalcite,				1	Silky.	White.	White, gray.	Soluble in water.	Fusible. Water.
216	Nitromagnesite?									
217	Sassolite,	5	Lamellar.	1.4	1	Pearly.	White.	White, yellowish.	Soluble in water.	Fusible. Boron. Water.
218	Borax,	4	Conchoidal.	1.7	2 to 2.5	Vitreous, resinous.	White.	White, grayish, bluish, greenish.	Soluble in water.	Fuses to a transparent glass. Boron. Water.
219	Ulexite,			1.6	1	Silky.	White.	White.	Soluble in hot water.	Fusible. Sodium. Boron. Water.
220	Warwickite,		Uneven.	3.1 to 3.4	3 to 4	Sub-metallic, vitreous, pearly.	Bluish black.	Brown, black, copper red.	Decomposed by sulphuric acid.	Infusible. Titanium. Boron. Iron. Water.
221	Wolframite,	3	Uneven.	7.1 to 7.5	5 to 5.5	Sub-metallic.	Reddish brown, black.	Brownish black.	Decomposed by aqua regia.	Fusible. Iron. Tungsten. Manganese.
222	Hubnerite,	3	Uneven.	7.1	4.5	Adamantine, greasy.	Yellowish brown.	Brownish red to black.	Partially soluble in hydrochloric acid.	Fuses with difficulty. Manganese. Tungsten.
223	Wulfenite,	3	Uneven.	6 to 7	2.75 to 3	Resinous, adamantine.	White.	Yellow, green, gray, white, brown, red.	Decomposed.	Fusible. Lead. Molybdenum.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
224	Barite,	3	Uneven.	4.3 to 4.7	2.5 to 3.5	Vitreous, resinous, pearly.	White.	White, blue, yellow, red, gray, brown.	Insoluble.	Fuses with difficulty. Barium. Sulphur.
225	Celestite,	3	Conchoidal, uneven.	3.9	3 to 3.5	Vitreous, pearly.	White.	White, bluish, reddish.	Insoluble.	Fusible. Strontium. Sulphur.
226	Anhydrite,	3	Uneven.	2.8 to 2.9	3 to 3.5	Vitreous, pearly.	Grayish white.	White, grayish, bluish, reddish, red.	Soluble in hydrochloric acid.	Fusible. Sulphur.
227	Anglesite,	3	Conchoidal.	6.1 to 6.3	2.75 to 3	Adamantine.	Uncolored.	White, yellow, gray, green, blue.	Soluble with difficulty in nitric acid.	Fusible. Lead. Sulphur.
228	Leadhillite,	3	Conchoidal.	6.2 to 6.4	2.5	Pearly, resinous.	Uncolored.	White, yellow, green, gray.	Partially soluble in nitric acid.	Fusible. Lead. Sulphur.
229	Caledonite,	3	Uneven.	6.4	2.5 to 3	Resinous.	Greenish white.	Green.	Partially soluble in nitric acid.	Fusible. Lead. Sulphur.
230	Glauberite,	4	Conchoidal.	2.6 to 2.8	2.5 to 3	Vitreous.	White.	Yellow, gray, red.	Soluble in water.	Fusible. Sodium. Sulphur.
231	Mirabilite,	4	Uneven.	1.4	1.5 to 2	Vitreous.	White.	White.	Soluble in water.	Fusible. Sodium. Sulphur. Water.
232	Gypsum,	4	Uneven.	2.3	1.5 to 2	Pearly, vitreous.	White.	White, gray, yellow, red, blue, black, brown.	Soluble in hydrochloric acid.	Fusible. Sulphur. Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
233	Epsomite,	3	Uneven.	1.7	2.25	Vitreous, earthy.	White.	White.	Soluble in water.	Fusible. Magnesium. Sulphur. Water.
234	Melanterite,	4	Conchoidal.	1.8	2	Vitreous.	Uncolored.	Green to white.	Soluble in water.	Fusible. Iron. Sulphur. Water.
235	Morenosite,			2	2	Vitreous.	White, greenish.	Green.	Soluble in water.	Fusible. Nickel. Sulphur. Water.
236	Chalcanthite,	5	Conchoidal.	2.2	2.5	Vitreous.	Uncolored.	Blue.	Soluble in water.	Fusible. Copper. Sulphur. Water.
237	Alunogen,	4	Uneven.	1.6 to 1.8	1.5 to 2	Vitreous, silky.	White.	White, yellow, red.	Soluble in water.	Fusible. Aluminum. Sulphur. Water.
238	Kalinite,	1	Conchoidal, uneven.	1.7	2 to 2.5	Vitreous.	White.	White.	Soluble in water.	Fusible. Aluminum. Sulphur. Water.
239	Bosjemanite,					Silky.	White.	White.	Soluble in water.	Fusible. Aluminum. Sulphur. Manganese. Water.
240	Jarosite,	6		2.6 to 3.2	2.5 to 3.5	Dull.	Yellow.	Yellow.	Soluble in water.	Fusible. Iron. Sulphur. Water.
241	Johannite,	4		3.1	2 to 2.5	Vitreous.	Paler than color.	Green.	Soluble in water.	Fusible. Sulphur. Water.

No.	Name.	C. S.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
242	Montanite,				1	Dull, waxy.	White.	Yellowish to white.	Soluble in hydrochloric acid.	Fusible. Bismuth. Tellurium. Water.
243	Calcite,	6	Conchoidal.	2.5 to 2.7	2.5 to 3.5	Vitreous, earthy.	White, grayish.	White, gray, green, red, yellow, black.	Soluble with effervescence.	Infusible.
244	Dolomite,	6	Conchoidal, uneven.	2.8 to 2.9	3.5 to 4	Vitreous, pearly.	White, grayish.	White, gray, green, red, brown, yellow, black.	Slowly soluble with effervescence.	Infusible.
245	Magnesite,	6	Flat conchoidal.	2.8 to 3.2	3.5 to 4.5	Vitreous, silky.	White.	White, yellow, brown.	Slowly soluble with effervescence.	Infusible. Magnesium.
246	Siderite,	6	Uneven.	3.7 to 3.9	3.5 to 4.5	Vitreous, pearly.	White.	Gray, brown, red, green, white.	Slowly soluble with effervescence.	Fuses with difficulty. Iron.
247	Smithsonite,	6	Uneven.	4 to 4.4	5	Vitreous, pearly.	White.	White, gray, green, brown.	Soluble with effervescence.	Infusible. Zinc.
248	Aragonite,	3	Conchoidal, uneven.	2.9	3.5 to 4	Vitreous, resinous.	Uncolored.	White, gray, green, yellow, violet.	Soluble with effervescence.	Infusible.
249	Witherite,	3	Uneven.	4.2 to 4.3	3 to 4	Vitreous, resinous.	White.	White, yellowish, greenish.	Soluble in hydrochloric acid.	Fusible. Barium.
250	Strontianite,	3	Uneven.	3.6 to 3.7	3.5 to 4	Vitreous, resinous.	White.	Green, white, gray, brown, yellow.	Soluble in hydrochloric acid.	Fuses with difficulty. Strontium.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
251	Cerussite,	3	Conchoidal.	6.4	3 to 3.5	Adamantine, vitreous, resinous.	Uncolored.	White, gray, blue, green, black.	Soluble in nitric acid.	Fusible. Lead.
252	Natron,	4		1.4	1 to 1.5	Vitreous, earthy.	White.	White, gray, yellow.	Soluble in water.	Fusible. Sodium. Water.
253	Thermonatrite,	3		1.5 to 1.6	1 to 1.5	Vitreous.	White.	White, grayish, yellowish.	Soluble in water.	Fusible. Sodium. Water.
254	Trona,	4		2.1	2.5 to 3	Vitreous.	White.	Gray, yellowish white.	Soluble in water.	Fusible. Sodium. Water.
255	Gay-Lussite,	4	Conchoidal.	1.9 to 2	2 to 3	Vitreous.	Uncolored, grayish.	White, yellow.	Soluble in acids, partly soluble in water.	Fusible. Sodium. Water.
256	Hydromagnesite,	4		2.1	1 to 3.5	Vitreous, silky.	White.	White.	Soluble with effervescence.	Infusible. Magnesium. Water.
257	Hydrodolomite,			2.4			White or same as color.	Yellowish white, grayish, greenish.	Soluble with effervescence.	Infusible. Magnesium. Water.
258	Lanthanite,	3		2.6	2.5 to 3	Pearly, dull.	White.	Grayish white, pink, yellowish.	Soluble with effervescence.	Infusible. Water.
259	Remingtonite,		Earthy.		1	Earthy.	Pale rose.	Rose.	Soluble with effervescence.	Infusible. Cobalt, Water.

No.	Name.	S. C.	Fracture.	Sp. Gr.	H.	Luster.	Streak.	Color.	Action of Acids.	Blow-pipe Reactions.
260	Hydrozincite.		Fibrous, earthy.	3.5 to 3.8	2 to 2.5	Dull.	Shining.	White, gray, yellow.	Soluble with effervescence.	Infusible. Zinc. Water.
261	Aurichalcite,				2	Pearly.	Paler than color.	Green, blue.	Soluble with effervescence.	Infusible. Copper. Zinc. Water.
262	Malachite,	4	Sub-conchoidal, uneven.	3.7 to 4	3.5 to 4	Adamantine, vitreous.	Paler than color.	Green.	Soluble with effervescence.	Fusible. Copper. Water.
263	Azurite,	4	Conchoidal.	3.5 to 3.8	3.5 to 4.5	Vitreous, adamantine.	Paler than color.	Blue.	Soluble with effervescence.	Fusible. Copper. Water.
264	Bismutite,			6.8 to 7.6	3.5 to 4.5	Vitreous, dull.	White, greenish gray.	White, green, yellow.	Soluble with effervescence.	Fusible. Bismuth. Water.

TABLE IV.

CHEMICAL CLASSIFICATION OF SPECIES.

I. NATIVE ELEMENTS.

Gold Group.

1. Gold
2. Silver

Iron Group.

3. Platinum
4. Iridosmine
5. Mercury
6. Gold-amalgam
7. Copper
8. Iron

Tin Group.

9. Tin

Arsenic Group.

10. Arsenic
11. Antimony
12. Bismuth

Sulphur Group.

13. Sulphur

Carbon-Silicon Group.

14. Diamond
15. Graphite

II. SULPHIDS, TELLURIDS, ARSENIDS, ANTIMONIDS.

A. SULPHIDS AND TELLURIDS OF THE METALS OF THE SULPHUR AND ARSENIC GROUPS.

Orpiment Group.

16. Orpiment
17. Stibnite
18. Bismuthinite

Tetradymite Group.

19. Tetradymite

Molybdenite Group.

20. Molybdenite

B. SULPHIDS, TELLURIDS, ARSENIDS, ANTIMONIDS OF THE METALS OF THE GOLD, IRON AND TIN GROUPS.

Basic or Dyscrasite Division.

21. Domeykite
22. Algodonite
23. Whitneyite

Proto or Galena Division.

Galena Group.

24. Argentite
25. Galenite
26. Bornite

Blende Group.

27. Sphalerite

Chalcocite Group.

28. Hessite
29. Chalcocite
30. Stromeyerite

Pyrrhotite Group.

31. Cinnabar
32. Millerite
33. Pyrrhotite
34. Greenockite
35. Niccolite
36. Breithauptite

Deuto or Pyrite Division.

Pyrite Group.

37. Pyrite
38. Chalcopyrite
39. Barnhardtite
40. Linnaeite
41. Smaltite
42. Gersdorffite

Marcasite Group.

43. Marcasite
44. Leucopyrite
45. Arsenopyrite

C. SULPHARSENITES, SULPHANTIMONITES, SULPHOBISMUTHITES.

46. Berthierite
47. Pyrargyrite
48. Proustite
49. Aikinite
50. Tetrahedrite
51. Geocronite
52. Stephanite
53. Polybasite
54. Enargite

III. CHLORIDS, IODIDS.

Halite Group.

55. Halite
56. Cerargyrite

Iodyrite Group.

57. Iodyrite

IV. FLUORIDS.

Fluorite Group.

58. Fluorite
59. Yttrocerite

Cryolite Group.

60. Cryolite

V. OXYDS.

A. BINARIES.

a. Oxyds of the Elements of the Iron and Tin Groups.

Anhydrous.

Protoxyds.

Cuprite Group.

61. Cuprite

Zincite Group.

62. Water
63. Zincite

Massicot Group.

64. Massicot
65. Melaconite

Sesquioxyds.

Corundum Group.

66. Corundum
67. Hematite
68. Menaccanite

Compounds of Protoxyds and Sesquioxyds.

Spinel Group.

69. Spinel
70. Gahnite
71. Magnetite
72. Franklinite
73. Chromite

Chrysoberyl Group.

74. Chrysoberyl

Deutoxyds.

Rutile Group.

75. Cassiterite
76. Rutile
77. Octahedrite
78. Hausmannite
79. Braunite
80. Minium.

Brookite Group.

81. Brookite
82. Pyrolusite

Hydrous Oxyds.

83. Turgite
84. Diaspore
85. Goethite
86. Manganite
87. Limonite
88. Brucite
89. Gibbsite
90. Hydrotalcite
91. Psilomelane
92. Wad

b. Oxyds of the Elements of the Arsenic and Sulphur Groups.

Arsenolite Group.

93. Arsenolite

Valentinite Group.

94. Molybdite
95. Tungstite

Cervantite Group.

96. Cervantite
97. Partzite?

c. Oxyds of the Elements of the Carbon-Silicon Group.

98. Quartz
99. Opal

B. TERNARIES.

Silicates.

ANHYDROUS.

I. Bisilicates.

Amphibole Group.

100. Enstatite
101. Hypersthene
102. Wollastonite
103. Pyroxene
104. Rhodonite
105. Babingtonite
106. Spodumene
107. Petalite
108. Amphibole

Beryl Group.

109. Beryl
109 *a*. Eudialyte

II. Unisilicates.

Chrysolite Group.

110. Fosterite
111. Chrysolite
112. Tephroite

Phenacite Group.

113. Willemite

Helvite Group.

114. Danalite

Garnet Group.

115. Garnet

Vesuvianite Group.

116. Zircon
117. Vesuvianite

Epidote Group.

118. Epidote
119. Allanite
120. Zoisite

Axinite Group.

121. Axinite
122. Danburite

Iolite Group.

123. Iolite

Mica Group.

124. Phlogopite
125. Biotite
126. Muscovite
127. Lepidolite
128. Cryophyllite

Scapolite Group.

129. Wernerite
130. Ekebergite

Nephelite Group.

131. Nephelite

Leucite Group.

132. Sodalite

Feldspar Group.

133. Labradorite
134. Oligoclase
135. Albite
136. Orthoclase

III. Subsilicates.

Chondrodite Group.

137. Chondrodite

Tourmaline Group.

138. Tourmaline

Andalusite Group.

139. Andalusite
140. Fibrolite
141. Cyanite
142. Topaz

Euclase Group.

143. Datolite

Titanite Group.

144. Titanite

Staurolite Group.

145. Staurolite

Schorlomite Group.

146. Schorlomite

HYDROUS SILICATES.

GENERAL SECTION.

I. Bisilicates.

Pectolite Group.

147. Pectolite
148. Gyrolite
149. Laumonite

Dioptase Group.

150. Chrysocolla

II. Unisilicates.

Calamine Group.

151. Calamine
152. Prehnite
153. Chlorastrolite

Apophyllite Group.

154. Apophyllite

III. Subsilicates.

155. Allophane
156. Schrotterite

ZEOLITE SECTION.

I. Unisilicates.

Mesotype Group.

157. Thomsonite
158. Natrolite
159. Mesolite

I. Bisilicates.

Analcite Group.

160. Analcite

Chabazite Group.

161. Chabazite

Stilbite Group.

162. Stilbite
163. Epistilbite
164. Heulandite

MARGAROPHYLLITE SECTION.

I. Bisilicates.

Talc Group.

165. Talc
166. Pyrophyllite
167. Pihlite

Sepiolite Group.

168. Smectite

Chloropal Group.

169. Stilpnomelane
170. Glauconite

II. Unisilicates.

Serpentine Group.

171. Serpentine
172. Deweylite
173. Cerolite
174. Hydrophite
175. Genthite
176. Saponite

Kaolinite Group.

177. Pholerite
178. Kaolinite
179. Halloysite

Pinite Group.

180. Pinite
181. Palagonite

Margarodite Group.

182. Fahlunite
183. Margarodite
184. Euphyllite
185. Cookeite

III. Subsilicates.

Chlorite Group.

185 *a*. Vermiculite
186. Jefferisite
187. Penninite
188. Ripidolite
189. Prochlorite

Chloritoid Group.

190. Corundophilite
191. Chloritoid
192. Margarite
193. Thuringite

Seybertite Group.

194. Seybertite

Tantalates, and Columbates.

Pyrochlore Group.

195. Microlite

Tantalate Group.

196. Columbite

Phosphates, Arsenates, Nitrates.

ANHYDROUS PHOSPHATES, ARSENATES.

Xenotime Group.

197. Xenotime

Apatite Group.

198. Apatite
199. Pyromorphite
200. Mimetite

Wagnerite Group.

201. Monazite

Triplite Group.

202. Triphylite

Amblygonite Group.

203. Amblygonite

HYDROUS PHOSPHATES, ARSENATES.

BASES IN THE PROTOXYD STATE.

Vivianite Group.

204. Vivianite
205. Erythrite
206. Annabergite

Liroconite Group.

207. Pseudomalachite

BASES WHOLLY OR IN PART IN THE SESQUIOXYD STATE.

208. Scorodite
209. Lazulite
210. Wavellite
211. Childrenite
212. Turquois.
213. Autunite

Nitrates.

214. Nitre
215. Nitrocalcite
216. Nitromagnesite

Borates.

217. Sassolite
218. Borax
219. Ulexite
220. Warwickite

Tungstates, Molybdates.

221. Wolframite
222. Hubnerite
223. Wulfenite

Sulphates, Tellurates.

ANHYDROUS.

Celestite Gronp.

224. Barite
225. Celestite
226. Anhydrite
227. Anglesite
228. Leadhillite

Caledonite Group.

229. Caledonite

Glauberite Group.

230. Glauberite

HYDROUS SULPHATES.

231. Mirabilite
232. Gypsum
233. Epsomite
234. Melanterite
235. Morenosite
236. Chalcanthite
237. Alunogen
238. Kalinite
239. Bosjemannite
240. Jarosite
241. Johannite

HYDROUS TELLURATES.

242. Montanite

Carbonates.

ANHYDROUS.

Calcite Group.

243. Calcite
244. Dolomite
245. Magnesite
246. Siderite
247. Smithsonite

Aragonite Group.

248. Aragonite
249. Witherite
250. Strontianite
251. Cerussite.

HYDROUS CARBONATES.

252. Natron
253. Thermonatrite
254. Trona
255. Gay-Lussite
256. Hydromagnesite
257. Hydrodolomite
258. Lanthanite
259. Remingtonite
260. Hydrozincite
261. Aurichalcite
262. Malachite
263. Azurite
264. Bismutite

TABLE V.

CLASSIFICATION BY BASIC ELEMENTS AND ORES.

I. SULPHUR.
Sulphur.

II. MOLYBDENUM.
Molybdenite.

III. TUNGSTEN.
Tungstite.

IV. BORON.
Sassolite.

V. ARSENIC.
Arsenic.
Orpiment.
Arsenolite.

VI. ANTIMONY.
Antimony.
Stibnite.
Berthierite.
Cervantite.
Partzite.

VII. BISMUTH.
Bismuth.
Bismuthinite.
Tetradymite.
Aikinite.
Montanite.
Bismutite.

VIII. CARBON.
Diamond.
Graphite.

IX. GOLD.
Gold.
Gold-Amalgam.

X. SILVER.
Silver.
Argentite.

Stromeyerite.
Hessite.
Pyrargyrite.
Proustite.
Stephanite.
Polybasite.
Cerargyrite.
Iodyrite.

XI. PLATINUM.
Platinum.

XII. IRIDOSMINE.
Iridosmine.

XIII. MERCURY.
Mercury.
Cinnabar.

XIV. COPPER.
Copper.
Chalcocite.
Chalcopyrite.
Barnhardtite.
Bornite.
Domeykite.
Algodonite.
Whitneyite.
Tetrahedrite.
Enargite.
Cuprite.
Melaconite.
Chalcanthite.
Pseudomalachite.
Malachite.
Azurite.
Chrysocolla.

XV. LEAD.
Galenite.
Geocronite.
Minium.
Massicot.
Anglesite.
Caledonite.
Wulfenite.
Leadhillite.
Pyromorphite.
Mimetite.
Cerussite.

XVI. ZINC.
Sphalerite.
Zincite.
Smithsonite.
Hydrozincite.
Aurichalcite.

XVII. CADMIUM.
Greenockite.

XVIII. TIN.
Cassiterite.

XIX. TITANIUM.
Rutile.
Octahedrite.
Brookite.

XX. COBALT.
Linnæite.
Smaltite.
Erythrite.
Remingtonite.

XXI. NICKEL.
Millerite.
Niccolite.
Breithauptite.
Gersdorffite.
Annabergite.
Morenosite.

XXII. URANIUM.
Autunite.
Johannite.

XXIII. IRON.
- Iron.
- Pyrite.
- Marcasite.
- Pyrrhotite.
- Arsenopyrite.
- Leucopyrite.
- Hematite.
- Menaccanite.
- Magnetite.
- Franklinite.
- Chromite.
- Limonite.
- Gœthite.
- Turgite.
- Melanterite.
- Jarosite.
- Wolframite.
- Columbite.
- Vivianite.
- Scorodite.
- Siderite.

XXIV. MANGANESE.
- Pyrolusite.
- Hausmannite.
- Braunite.
- Manganite.
- Psilomelane.
- Wad.
- Triphylite.
- Hubnerite.

XXV. ALUMINUM.
- Corundum.
- Diaspore.
- Gibbsite.
- Spinel.
- Gahnite.
- Chrysoberyl.
- Cryolite.
- Alunogen.
- Kalinite.
- Bosjemanite.
- Amblygonite.
- Lazulite.
- Turquois.
- Childrenite.
- Wavellite.

XXVI.
- CERIUM.
- YTTRIUM.
- LANTHANUM.
- DIDYMIUM.
- Yttrocerite.
- Monazite.
- Xenotime.
- Lanthanite.

XXVII. MAGNESIUM.
- Brucite.
- Hydrotalcite.
- Hydromagnesite.
- Epsomite.
- Warwickite.
- Nitromagnesite.
- Magnesite.

XXVIII. CALCIUM.
- Fluorite.
- Gypsum.
- Anhydrite.
- Ulexite.
- Apatite.
- Microlite.
- Calcite.
- Aragonite.
- Dolomite.
- Hydrodolomite.

XXIX. BARIUM.
- Barite.
- Witherite.

XXX. STRONTIUM.
- Celestite.
- Strontianite.

XXXI. POTASSIUM.
- Nitre.

XXXII. SODIUM.
Halite.
Mirabilite.
Glauberite.
Borax.
Natron.
Trona.
Thermonatrite.
Gay-Lussite.

XXXIII. SILICON.
Quartz.
Opal.

XXXIV. SILICATES.
See Table IV.

APPENDIX.

(Subjects arranged in alphabetical order.)

1. AMPHIBOLE. Amphibole and Pyroxene are very much alike and when there is no crystalline structure it is impossible to distinguish between them. Amphibole crystals are usually long and bladed, though sometimes stout. The angles of cleavage are 124° 30′ and 55° 30′. Has no cleavage parallel to the base. Pyroxene crystals are usually thick and stout—never having a slender bladed form. The angles of cleavage parallel to the prism are 87° and 93°. Has cleavage parallel to the base.

Varieties. 1. Tremolite (Magnesia-Lime Amphibole), occurs in crystalline as well as in columnar, fibrous and massive granular forms. Color white to gray. Contains little or no iron. 2. Actinolite (Magnesia-Lime-Iron Amphibole). Forms same as Tremolite. Color bright green to grayish green. Contains a little iron. 3. Cummingtonite (Iron-Magnesia Amphibole). Forms fibrous and fibro-lamellar. Color gray to brown. Contains much iron. B. B. becomes magnetic. 4. Hornblende (Aluminous-Magnesia-Lime-Iron Amphibole). Forms as in Tremolite. Colors deep green, greenish black and black. Sometimes contains much iron and becomes magnetic before the blowpipe. 5. Asbestus is a name given to tremolite, actinolite and some other varieties of Amphibole when they pass into fibrous varieties. The fibers are sometimes long and slender and easily separable by the fingers and have a silky luster. When the fibers are knitted together the names Mountain Paper, Mountain Cork, Mountain Leather or Mountain Wood are applied according to the resemblances.

2. ANDALUSITE, FIBROLITE AND CYANITE (KYANITE). Andalusite is never fibrous. Crystallizes in right, nearly square prisms. Occurs also imperfectly columnar, sometimes radiated, and granular, also massive. Fibrolite crystals are inclined rhombic prisms generally long, slender, rough and sometimes striated. Is often fibrous or columnar massive. Cyanite occurs in long, flat, oblong and nearly rectangular crystals, also as coarsely bladed columnar.

3. ASBESTUS. See varieties of Amphibole and Pyroxene.

4. BROOKITE, OCTAHEDRITE. Brookite occurs generally in thin plates which are referred to the right rhombic prism and has very indistinct cleavage. Octahedrite is always in crystals which are octahedral or tabular and has perfect cleavage.

5. FAHLUNITE, MARGARITE. Fahlunite is grayish green to dark olive green and sometimes black. It occurs in six to twelve sided prisms with basal cleavage which is usually not perfect. Margarite is reddish white, grayish or yellowish. It crystallizes in the orthorhombic system but with monoclinic aspect and lateral planes striated. Cleavage is basal and always perfect. It occurs usually in aggregated laminal, but sometime massive with a scaly structure.

6. HEULANDITE, STILBITE. Heulandite crystallizes in inclined rhombic prisms; occurs also in globular forms, also granular. Stilbite crystallizes in right rhombic prisms with usually the prism flattened parallel with cleavage face and pointed at the extremity. Often in sheaf-like aggregations—sometimes globular and thin lamellar columnar.

7. JEFFERSONITE. See varieties of Pyroxene, page 80.

8. KAOLINITE, PHOLERITE. Pholerite very strongly resembles kaolinite and ordinarily can be distinguished from it only by analysis. Composition of pholerite is silica 39-3, alumina 45, water 15-7; of kaolinite is silica 46-3, alumina 39-8, water 13-9.

9. NATROLITE, ANALCITE. Natrolite crystallizes in right rhombic prisms and has cleavage parallel to the prism. Crystals very rarely large, usually slender or acicular and frequently interlacing or divergent. Also fibrous and massive though almost always crystallized. Analcite crystallizes in the isometric system showing only traces of cleavage parallel to the faces of the cube. Found also massive granular.

10. OLIGOCLASE, ALBITE, ORTHOCLASE. It is often difficult to distinguish between these species. Orthoclase crystals belong to the nonoclinic system. Before the blow-pipe it fuses with great difficulty but does not color the flame yellow. Color usually flesh red, gray or white. Composition; silica 64-6, alumnia 18-5, potassa 16-9. Oligoclase and albite crystallizes in the triclinic system. Before the blow-pipe they fuse with great difficulty, coloring the flame yellow. Color of oligoclase usually greenish, of albite usually white but color cannot be depended upon to distinguish them. Composition of oligoclase, silica 62-1, alumnia 23-7, soda 14-2. Composition of albite, silica 68-6, alumnia 19-6, soda 11-8.

11. PYROXENE. As distinguished from amphibole see Amphibole page 78.

Varieties. 1. Malacolite (Lime-Magnesia Pyróxene); color white yellowish or greenish white to pale green. 2. Sahlite (Lime-Magnesia-Iron Pyroxene); color grayish green, deep green, black. 3. Hedenbergite (Lime-Iron Pyroxene); color black, crystals usually radiated around a centre. 4. Jeffersonite (Lime-Iron-Manganese-Zinc Pyroxene); color greenish black. Before the blow-pipe on charcoal with soda gives reaction for manganese and zinc. 5. Augite (Aluminous-Lime-Magnesia-Iron Pyroxene); color deep green to black—is nearly always a volcanic product. 6. Hudsonite (Aluminous-Iron-Lime Pyroxene); color black, streak green. Often with bronze tarnish. 7. Asbestus. A finely fibrous variety. Most asbestus belongs to the species amphibole, see page 78.

INDEX.

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